The
Electrical Review

VOL. CXIV. MARCH 23, 1934. No. 2939.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY. Price 6d.

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

Telegraphic Address: "AGEEKAY, WATLOO, LONDON." Code, A B C. Telephone No.: Hop 3333 (50 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES. Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

Principal Contents:

	PAGE
Large-scale Cooking	403
Power Transformer Protection. By G. W. Stubbings	406
Sub-station Maintenance. By J. Eccles	407
Domestic Cookers. By A Consumers' Engineer	409
Estate Distribution	411
A Compensated Reactor	412
Meetings and Discussions	413
Correspondence: Rural Electrification Problems; Engineers and Economics; The 1934 Electricity Regulations; Consciousness After Electric Shock; Lift-control Circuits; Electro-thermal Apparatus; Practical Experience Essential; A Flexible Installation; "Free" Cookers Criticised	416
Two Electrical Functions at Manchester	418
New Apparatus and Devices	419
British Overseas Electrical Trade	421
E.D.A. Reviews its Work	421
Electrical and Allied Manufacturing in 1933	422
The Poplar Coal Contracts	423
Business and Industrial Notes	424
Electricity Supply	427
Contract Information	430
Our Personal Column	432
New Companies Registered	433
Returns of Electrical Companies	433
City Notes	433
Stocks and Shares	435
Published Specifications	437
New Work for Contractors	438

Large-scale Cooking

IT used to be an accepted practice of electrical speakers to say that "only the fringe" of the domestic load had been touched. This is becoming less true, but the phrase can certainly be transferred to the commercial cooking and baking load. The all-electric restaurant is still novelty enough to be advertised as such, while the electric bakery is even rarer.

Why is it that progress is so slow in this direction when in industry and the home the tempo is increasing? The question of cost has first to be studied. No matter how superior the electrical method is in speed, cleanliness, ease of control and saving of labour, the test invariably applied by the inquirer is, "Does it pay?" or, put in another way, "What does it cost?"

It may be possible to persuade a prospective customer by demonstration that there is a cash value in the superior attributes of electricity, but he will refuse to place the salesman's valuation on these. They cannot outweigh what may be considered an excessive outlay as compared with that required for other methods.

The cost of equipment must be comparable to some degree with that of a coal, gas, or oil installation, or there will be an insuperable barrier at the very commencement of negotiations. Only experience can show what the prospective user is prepared to pay for the admitted advantages of electricity—those which we have already mentioned and the other important one of "decentralisation."

We believe that equipment is becoming available at economic prices, and an increased demand will enable the manufacturers to produce it still more cheaply. Any effort tending towards this result is worthy of encouragement.

The question of running costs is a much simpler matter once the customer has been convinced that it is worth his while to purchase electrical equipment. Owing to the rarity of these installations definite data are lacking. It is a very good scheme to introduce inquirers to actual users of electric ovens, with whom they will be able to discuss the matter in the language of the trade.

In this matter of running costs comparative efficiencies assume considerable importance. It must be impressed on the prospect that electric heat is clean heat which is efficiently applied exactly where it is wanted, and controllable to within very narrow limits. The apparent cost, as compared with other agents, is not the real cost; it is here that good salesmanship, backed by expert knowledge, is called for.

It appears quite clear that if one successful installation can be got going in a town others will inevitably follow. While we would not suggest that an electricity supply authority should undertake to give a supply to an all-electric bakery or restaurant at unremunerative rates, as a vehicle of propaganda, we consider that it is worth while assiduously "nursing" the pioneers of all-electric cooking to get things going in the district. For this reason we recommend that supply undertakings should make a thorough study of the subject and then proceed more energetically to secure this very desirable class of business.

E.D.A. Advancing

YESTERDAY afternoon—too late for the proceedings to be reported in this issue—the British Electrical Development Association held its first annual meeting as a reconstituted body. The report submitted by the Council, and summarised on page 421, covers a period when the great change-over was in progress, so the results obtained in 1933 are not, and will not be, fairly comparable with those of any other year. The Central Board came to the rescue with the financial aid that has been needed for a long time past, and the main results of the reorganisation have been an addition of thirty-one undertakings to the membership, an increased rate of subscription from thirty-eight others, and an advance in electricity supply contributions from £31,452 in 1932 to £57,506 in 1933. This financial improvement is chiefly due to the Central Board having

contributed substantially, in proportion to the amount found by other undertakers, making the greater advertising activity of the last quarter of the year possible. E.D.A. literature was obviously in good demand, probably due to its improving suitability and to the readiness of undertakings to adopt it. It realised £10,000, which is 100 per cent. better than in 1932. All things considered the record is a very satisfactory one. The Association's pace shows very definite acceleration. What will be the story of the complete year 1934? More members, more money, greater activity in all legitimate directions, and general enthusiasm which will more rapidly increase the consumption of electricity and the installation of apparatus; the latter, of course, is *the* purpose for which a *development* association exists.

Grouping Generation

IN an article published in this week's Basic Industries Supplement of the *Daily Telegraph*, Dr. A. H. Railing draws the attention of owners of collieries and steel works to the benefits inherent in the district grouping of generating plant. He points out that the improved thermal efficiency, higher load factor, and fuller use of by-product gases would reduce the cost of electricity, and thus encourage the installation of electric winders, rolling mills, and furnaces. We would add that the centralisation of the works generating plant also spreads the mechanical stress due to the high short-period peaks caused by the winders and mills, in coping with which small isolated plants are at so great a disadvantage. Inter-connection with a large public supply system would give yet more relief, and would also provide an outlet for surplus energy, thus improving the operating conditions and reducing still further the cost of electrical methods.

Lancashire's Growing Load

THE report of the Lancashire Electric Light & Power Co., Ltd., just issued, contains, in addition to the account of the operations during last year, a comparative table showing the remarkable results that have been obtained during the four years from 1930 to 1933. The units generated or purchased advanced by ten millions in 1931, and by nearly twenty-four millions in 1932, but in 1933 they went up by a further thirty-nine millions, making a grand total of over 326 millions. The h.p. connected went ahead well last year. The receipts were better by £70,000 for an expenses increase of £23,000, and the profit on trading at £343,900 showed an upward move of between £46,000 and £47,000. As has been shown lately in these pages, the subsidiary operating companies have been extending the mains and distributors for all classes of business and have been engaging in active rural and domestic propaganda. The advance in the dividend from 7 to 7½ per cent. is not a matter for surprise and continuous progress may be expected if the depression upon certain industries continues to lift or others take their place. The stations of the Parliamentary company came under the Board's scheme at the beginning of this year.

Static Sub-stations

THOSE who have been used to the maintenance of rotating machinery are sometimes apt to under-rate the work involved in the care of static plant. In this issue Mr. J. Eccles shows that for the prevention of deterioration and misoperation of static substations (the number and importance of which increase with the more general adoption of a.c. systems and the accompanying development of h.v. distribution) a well-organised scheme of maintenance is equally essential. A point to be borne in mind is that all maintenance overhauls should be carried out under the immediate supervision of an "authorised person" (as defined in Home Office Regulation No. 31), who should be responsible for isolating all high-voltage circuits and for ensuring that the safety regulations are complied with. Responsibility for observance of the Home Office Regulations is not necessarily confined to the undertaking or even to the maintenance engineer; the authorised person may be liable in law should an accident occur owing to negligence on his part. It is an essential part of the duties of all who are engaged on maintenance work to study and understand the requirements of the various safety regulations which apply to this work.

A Comparison

THE gas engineer at Aberdeen, in opening a showroom, is reported to have alleged that electricity costs from twice to ten times as much as gas, depending upon the purpose for which it is used. He asks the public not to believe all that the salesman has to "put over." We quite agree. Let us have easily established facts. Thus Mr. S. G. Marston, engineer and manager of the Stockton-on-Tees electricity undertaking, in an address to the E.A.W., said that in some working-class houses in his area the quarterly cost of gas for cooking and electricity for lighting averaged 35s. After substituting electric cookers the accounts worked out at 23s. 10d. per quarter. The upper limit in the gas engineer's comparison would be correct only if gas of 500 B.th.u. per cu. ft. were supplied for cooking at ¼d. per therm, with electricity at ½d. per kWh.

Automobile Electrical Troubles

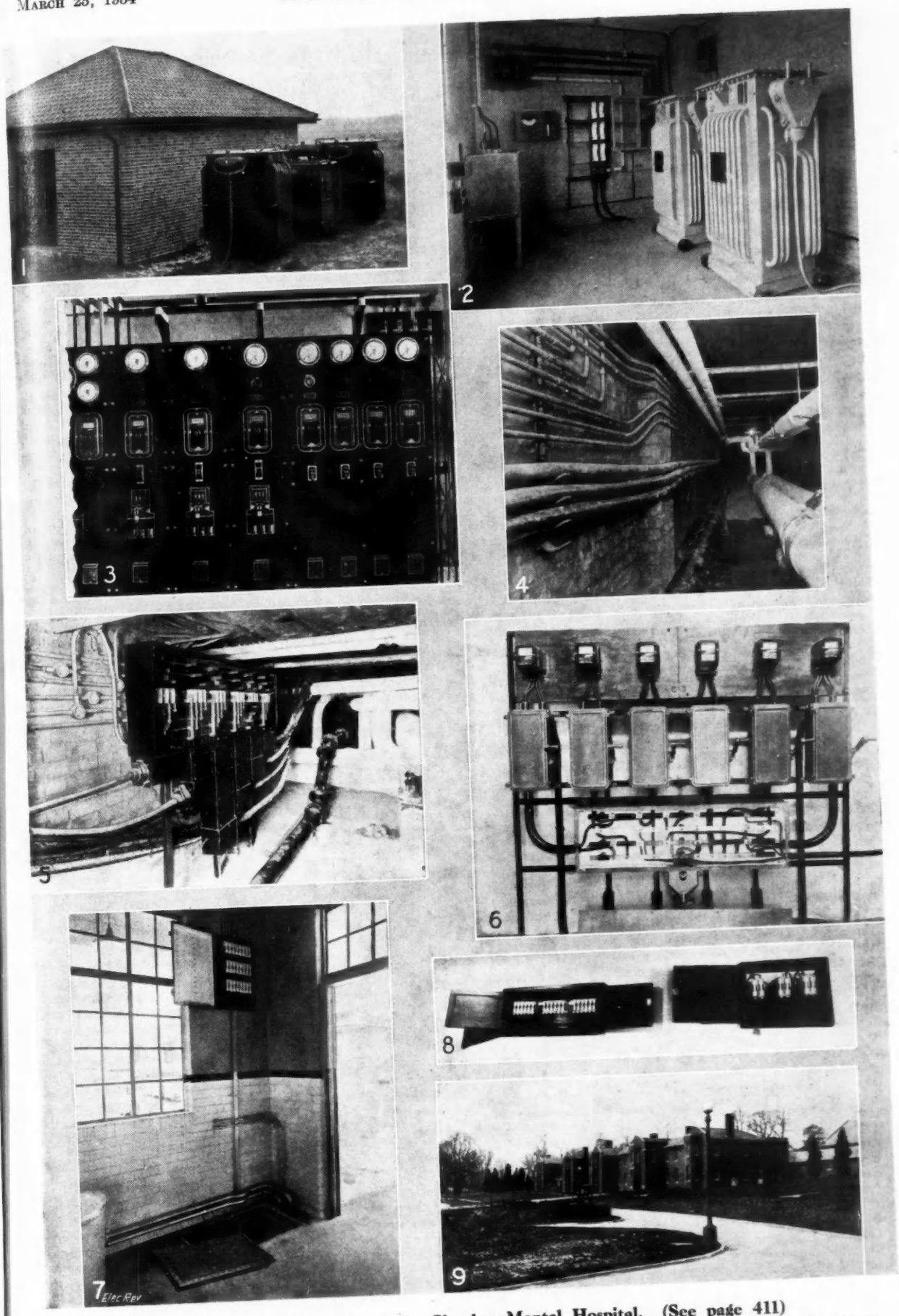
THE Royal Automobile Club has lately issued its report for 1933 on the causes of the breakdowns of motor vehicles, based on figures obtained from its "Get You Home" scheme for members. This shows that engine ignition trouble continues to be far and away the most prolific cause of breakdown, and, although most of the trouble may be due to lack of attention on the part of motorists, the point is one that manufacturers of such devices ought to take into consideration. As a matter of fact, the proportion of breakdowns due to ignition faults during the past five years has varied only a few decimal points above 20 per cent.; for 1932 the figure was 20.4 per cent., and for last year 20.2 per cent. The electric starting equipment of motor vehicles, on the other hand, may be regarded as satisfactory, its failure having been responsible for only 1.2 per cent. of breakdowns, the same as in 1932. The electric lighting of cars, also, on the whole, functions well, although the failures under this heading increased from 2.5 per cent. to 2.9 per cent. last year. No separate mention is made in the analysis of the behaviour of the batteries used on motor vehicles.

Man-Power

A SOLUTION of the problem of charging radio batteries where no mains supply or private plant exists has been arrived at in an Indian frontier village. A secondhand 6-V motor-car lighting generator has been obtained, and this will be belt-driven from the jacked-up wheel of a bicycle. Power is to be provided by schoolboys doing a few minutes' pedalling, each in turn, as part of the morning's gymnastics. Possibly there are still parts of Great Britain where a similar scheme would be welcomed, but we hope it will not be for long.

The Improving Outlook

READERS will derive more satisfaction than usual from a study of B.E.A.M.A.'s annual review of the electrical trade position. Though it is stated that in 1933 our electrical manufacturers probably passed through "one of the worst phases in the history of the industry," the outlook for "electrical manufacture in general" is now regarded as, "on the whole, promising." The circumstances leading the Council to these and other interesting conclusions appear on page 422. A speech delivered by Mr. R. P. Sloan on Tuesday, and also published today, refers to the revival that is taking place in the great industries of the North-Eastern area in such terms as will doubtless add materially to the growing spirit of optimism in the electrical industry.



The Distribution System of the Shenley Mental Hospital. (See page 411)

1. The main "Northmet" outdoor sub-station (20,000/3,000 V). 2. Interior of the site sub-station showing heavy bar connections through the wall to the switchboard. 3. A section of the main switchboard. 4. Cabling and conduit work in a section of the underground duct. 5. A double bus-bar main link box in a duct. 6. A typical block switchboard with the bus-bar arrangements exposed. 7. A power circuit lead-out from the duct to an ironclad distribution board. 8. Three-phase power and d.p. lighting recessed distribution boards in a corridor. 9. Administrative offices showing street-lighting standards

Power Transformer Protection.

By G. W. Stubbings, B.Sc., A.M.I.E.E.

THE automatic protection of a power transformer by the differential-current method varies somewhat from the method when applied to a generator. With a generator, the primary currents which are compared in the protective circuit are normally identical, and the only difference currents found in the relays are due either to faults or to imperfections of the protective current transformers. With a power transformer the primary currents compared by the protective circuit are not the same; they differ by a nearly constant ratio, and the primary current contains an exciting component which is not transferred to the secondary. When single-phase transformer units are interconnected to form a three-phase bank, an additional complication may arise in that the external secondary currents may normally be displaced in phase from the corresponding primary currents. A further complication, which is often overlooked, is that the external system fed by the secondary of the power transformer may be four-wire, while the primary supply is three-wire.

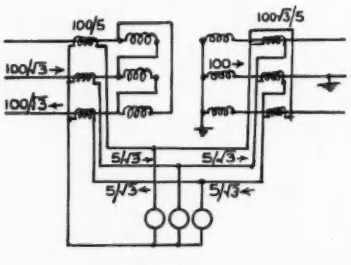


Fig. 1

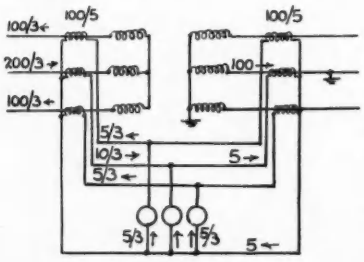


Fig. 2

The complication due to the difference of the primary and secondary currents by a constant ratio is easily overcome by a suitable choice of the ratios of the protective current transformers. The normal phase difference between primary and secondary currents arising in some three-phase transformer combinations can also be corrected by a suitable interconnection of the secondary circuits of the current transformers whereby a compensating phase shift is introduced which brings the currents delivered into the protective circuit by both sets of current transformers into phase conjunction.

The Delta-Star Connection

A familiar example of a three-phase transformer, in which there is a difference between the phases of the primary and secondary currents, is the delta/star connection, the Merz-Price protective circuit for which is shown in fig. 1. The line voltages on the primary and secondary sides are taken to be equal. The delta connection of the protective transformers on the secondary side brings about the compensating phase shift referred to, so that the currents delivered into the circulating current system by the two sets of current transformers are in phase. The conditions are shown for an earth fault of 100 A on the secondary side. The currents in the protective circuit are seen to be in balance. The case illustrated is one in which the secondary supply is four-wire and the primary supply three-wire. It will be observed that the delta connection of the protective transformers on the secondary side of the power transformer converts the four-wire circuit to three-wire in the protective circuit.

If three single-phase transformers are connected in star on both primary and secondary sides, then (provided each transformer will stand full line voltage without magnetic saturation) the short-circuiting of one of the secondary windings will give rise to very little current. The voltage across the primary of the short-circuited unit will practically disappear, and the two neutrals will assume line potential. Similar considerations apply to a three-phase shell transformer connected star/star.

The conditions are, however, quite different for a three-phase core-type transformer connected star/star. Here the magnetic circuits are interlinked, and a load can be taken between one secondary line terminal and the neutral without greatly modifying the potentials of the neutrals.

The machine, in short, behaves as a single-phase transformer with three-phase excitation. The primary ampère turns balancing those due to the secondary load current are supplied by single-phase currents flowing in all three lines of the primary supply. The primary line corresponding to the loaded secondary phase carries double the current of the other two lines. If the number of turns on the primary and secondary windings are equal, then, since the primary currents in the lines corresponding to the unloaded secondary phase flow in windings surrounding limbs of the core magnetically in parallel, the primary ampère turns will be $N(I_1+I_1/2)$, I_1 being the greatest primary line current and N the number of primary and secondary turns on each limb of the core. The secondary ampère turns will be NI_2, where I_2 is the secondary current. The value of I_1/I_2 is thus 2/3. This ratio can be checked by comparing the power input and output of the transformer, considering that the secondary load is non-inductive and neglecting transformer resistance and leakage reactance. The vectors of primary and secondary currents are as shown in fig. 4. The secondary output is evidently I_2V. The primary input is $V(I_2+2\times I_2/2\times 1/2)$, since the currents in lines A and C are 60 degrees out of phase with the corresponding phase voltages. Thus, as before, $I_1/I_2=^2/_3$.

As, with symmetrical loading, the primary and secondary currents of a star/star transformer are in phase, it might be thought that a star/star connection of the current transformer at each end of the protective circuit would be satisfactory. Such a connection with a single-phase load taken between line and neutral on the secondary side is shown in fig. 2, in which current appears in all three of the protective relays. Here the difficulty is that the primary supply is three-wire, while the secondary is four-wire. In the protective circuit one set of current transformers gives a residual current of 5 A, which is not produced by the other set. The star connection of the protective transformers is thus inadmissible.

With the delta/star power transformer, the delta connection of the protective transformers corresponding to the star-connected side of the power transformer converts the four-wire primary circuit into a three-wire circuit in the circulating current system. The same procedure must be adopted with the protective circuit for a star/star power transformer, but, as the interconnection of both sets of current transformers must be similar, the delta connection is also necessary for the current transformers on the primary side. The circuit conditions with a load taken between line and nuetral of the power transformer are shown for delta-connected current transformers in fig. 3. From this diagram it will be observed that the currents in the protective circuit are now in balance.

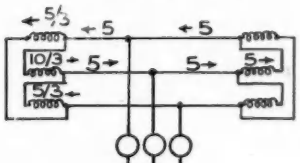


Fig. 3

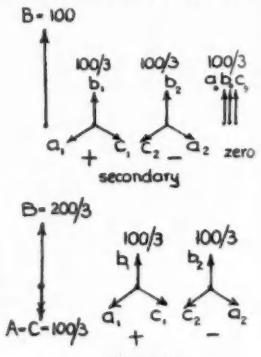


Fig. 4

The problem discussed affords an elegant illustration of the principles of symmetrical components. The single-phase current flowing from line to neutral on the secondary side of the power transformer is shown in fig. 4 resolved into positive, negative, and zero-sequence components. These three components are seen to be of equal magnitude. The primary currents are shown resolved in the same diagram. In this case there is no zero-sequence component; the positive and negative sequence components are equal in magnitude and are also equal to the corresponding components of the secondary current. Fig. 3 shows that the zero-sequence currents referred to the secondary circuit of the current transformers flow in the relays. In fig. 4 the zero-sequence currents in the secondary circuit of the current transformers are suppressed by the delta connection.

Zero-sequence Components

Difficulty is sometimes experienced in understanding how zero-sequence currents can appear in the secondary circuit of the power transformer without corresponding currents being found on the primary side. If the transformer be considered to be free from resistance or reactance drops the zero-sequence currents carry no power. If we make the further assumption that both primary and secondary voltages are symmetrical the whole of the primary and secondary powers are carried by the positive sequence components. The resolution of a three-phase system of currents into symmetrical components is, of course, merely a mathematical fiction, and these components need not be considered as having any physical existence.

Thus the equal primary and secondary ampère turns may be artificially considered as the resultants of differing sets of symmetrical components.

Sub-station Maintenance. By J. Eccles, B.Sc., A.M.I.E.E.

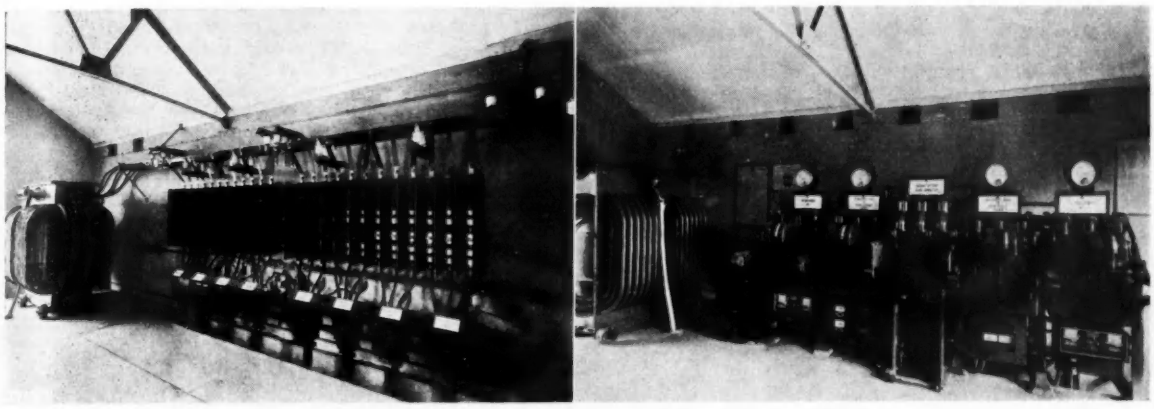
Preventing faults on static plant

THE ability of a circuit breaker to carry its rated current continuously without excessive heating can be checked when the switchgear is new by low-voltage tests at the rated current.

A fairly reliable test for abnormal temperature rise of the conductors of oil-immersed breakers in service may be made by touching the outside of the tank with the back of the hand. Where doubt exists the breaker should be isolated and the tank lowered. The causes of excessive temperature rise are usually either bad joints in the main conductors, poor contact pressure, oxidation of the contact surfaces, or eddy currents in surrounding metal. Bad joints may sometimes be detected by local temperature discoloration of the conductors.

guaranteed only if the protective relay, the trip battery (if any), the tripping solenoid, and the switch mechanism are in perfect working order. The word "perfect" is used advisedly, for nothing should be left to chance. The protective gear connection should be thoroughly tested by simulating fault conditions when the switchgear is first installed.

It is my considered opinion that, with one exception, protective gear connections should not be disturbed during routine maintenance unless facilities are available for a complete test of the readjusted equipment. The exception is balanced-voltage feeder protective gear. Under normal conditions the pilot wires of this gear carry no current, so that a broken wire can be detected only through failure to operate on a fault or by periodic testing. Maintenance should therefore include the



Left: Open bus-bar, medium-pressure layout, feeders protected by cartridge fuses and controlled by isolating links. Right: Layout of 6.6-kV switchgear in sub-station fed by ring main; the primary tripping battery is on left on panels

A set of feelers down to 1½ thousandths is very valuable in tracing bad contact surfaces at such joints. Clean surfaces between which a feeler at 1½ thousandths will not pass may be said to be in electrical contact. In switchgear of the fixed cubicle type the temperature of exposed live conductors may be roughly checked by means of a tallow candle secured to the insulated end of a link pole. If the temperature is excessive the tallow will run on being brought into contact with the conductor. The candle must not be inadvertently brought into contact with earthed metal during the test.

Temperature rise at the contacts may be due to insufficient pressure or poor bedding of the contact surfaces or to an oxide film. Copper oxide is a relatively poor conductor of alternating current, and even a thin film may cause an appreciable temperature rise. The brown oxide is easily detected and may be removed with sandpaper. Compounds of sulphur in the switch oil promote conductor oxidation. Some years ago certain manufacturers secured the fixed conductors in the porcelains by means of a sulphur compound, though the ends of the insulators immersed in oil were sealed with a hard-setting cement. Contact oxidation and consequent heating has been experienced with such switches owing probably to the breaking away of the cement and the exposure of sulphur to the oil.

Where oxidation is causing heating the insulator filling should be tested chemically for the presence of sulphur, and if a positive result is obtained the filling should be changed. The oil should also be tested, and if there is an appreciable trace of sulphur it should be renewed. Another source of sulphur compounds is the SO_2 absorbed by the oil through contact with the atmosphere. The possibility of temperature rise through eddy currents in earthed metal, especially in the case of new switchgear, is another point that should be kept in mind.

[*Balmain*

Mr. J. Eccles is a member of the staff of the Edinburgh Electricity Department

Routine Tests

The ability of a circuit-breaker to interrupt a circuit under fault conditions is largely governed by the circuit constants and the switch design, though much may be done by the maintenance engineer to preserve its performance. The first essential is to ensure that the switch will trip, and this may be

disconnection of both ends of the pilot cores—one core at a time—and testing with a megger for continuity and for faults between cores and to earth.

In all classes of protective gear routine inspection should include tests for loose connections and for free movement of the relay element; internal dust should be removed with a pair of bellows, and, if necessary, the contacts touched up with glass paper. Electro-plated relay contacts should not be permitted; in time the plating tends, perhaps imperceptibly, to crack and peel, and an oxide film forms beneath it. A low-voltage tripping circuit cannot break down this film, so that when the relay functions the trip coil is not energised. It is important to ensure that when relay covers are replaced no bare connections are in contact with earthed metal and that dust-tight gaskets are in position.

Care of the Tripping Battery

It is important to renew time-lag fuses regularly. Owing to the variations in temperature throughout the load cycle molecular crystallisation occurs which tends to lower the fusing current and ultimately to fracture the fuse element. This type of fracture is often difficult to detect with a galvanometer or "Megger," though it is sufficient to nullify the shunting value of the fuse. Overload fuses should, therefore, be rewired at intervals of one year on all circuits where load fluctuations are considerable.

Perhaps one of the most vulnerable parts of the protective circuit is the tripping battery; if a primary battery is used regular monthly inspections are essential. Without disturbing any connections a test should be carried out to prove that the battery will trip the switches. For a primary battery this might consist of momentarily short-circuiting the battery through an ammeter in series with a low resistance. A monthly record of the readings so obtained will show at a glance if the battery is deteriorating and how far the deterioration has gone.

A thorough inspection of the connections and cell elements should also be made for signs of corrosion or other form of deterioration. Corrosion once started advances rapidly, and, if overlooked during one inspection may have completely severed the connection before the next monthly visit. The importance

of detecting and eliminating incipient corrosion cannot be over-emphasised. Affected connections should be cleaned and vaselined. The tendency to corrode can be substantially reduced if the rims of cell jars and all terminals and connections are carefully covered with a light film of vaseline when the battery is first installed. The level of the electrolyte in each cell should also be checked at each inspection.

Sometimes the former on which the tripping solenoid is wound is composed of a fibrous material which expands under certain climatic conditions interfering with the free movement of the plunger. To prevent this a cylindrical brass liner should be fitted inside the formers.

Having lowered the tank, the switch contacts should be examined for alignment, contact bedding and burning of arcing contacts. All bolted joints should be tried for tightness and contacts checked for order of closing. This order should be: charging resistance contacts (if fitted); arcing contacts; and main contacts. Separate contacts must be provided for charging resistances and for arcing. Insulators should be examined for cracks or flaws and those having a synthetic resin base should be examined for signs of "tracking," particularly along the creepage surfaces. Tracking may be due in the first place to the fundamental law that particles of high permittivity which are free to move in a medium of lower permittivity always try to orient themselves in the positions of most intense electric stress. Hydrated carbon particles have high permittivity and hence tend to form a semi-conducting path along the insulator surface. Possibly the heat generated by the passage of minute currents through this path tends to scorch the surface of the insulator and leaves the now well-known tracks.

It is important that tracking should be detected in its earliest stages as the insulating value of this type of insulator depends largely on the preservation of its surface skin. Horizontal creepage surfaces are more prone to exhibit tracking than are vertical ones. All deposits should be removed with a soft, clean cloth saturated with clean insulating oil.

Switch Oil Tests

A sample of switch oil should be examined visually for signs of carbonisation or emulsification. The oil tests should include a dielectric breakdown test, and, if sulphur is suspected, an acid test. Methods of oil sampling and testing are given in B.S.S. No. 148/1933, but misleading results may follow careless handling. Each supply authority should be equipped with an oil testing set so that the dielectric strength may be determined whilst the overhaul is in progress, and a decision made as to whether or not the oil should be renewed.

It has been stated that oil which is free from other impurities may contain an appreciable quantity of moisture and still withstand a high breakdown voltage. This is probably true as regards transformer oil, but in oil in circuit-breakers, which are always liberally vented to atmosphere, there is usually present a small amount of acidity, generally H_2SO_4, partly derived from the atmospheric SO_2. Clean metal —copper and iron—surfaces in contact with insulating oil act as catalysts in the reaction involved in oxidising the SO_2 to SO_4.

An ordinary centrifugal separator with heating elements and filter removes solids and heavy liquids and tends to dry the oil. In so far as moisture is removed in the liquid phase, *i.e.* centrifugally, the acid content of the oil will be reduced, but if removed through evaporation the acid is merely concentrated.

Oil after being dried often gives a good dielectric test, but this, in my opinion, may be due to the lower ionisation of concentrated as compared with dilute acid; an acidic oil intended for further use in h.v. switchgear should be treated with an alkaline solution or with activated carbon, preferably at the suppliers' works.

Before replacing the tank a test should be made with a small dry battery and bell circuit to show that the auxiliary switch in the trip-coil circuit is closing well ahead of the main arcing contacts, and that it remains closed throughout the closing stroke so that the circuit may be fully protected.

The last act before restoring a switch to service should be to trip it by hand-operation of the protective relay as a final check that the trip circuit is complete and that the battery is functioning.

All transformers exhale air when the temperature is increasing and inhale it when the temperature is decreasing, and moisture in the incoming air will be absorbed by the oil. This moisture is not all driven off during the next heating cycle and as the effect is cumulative the humidity of the oil will in time rise to a dangerous extent.

The amount of moisture absorbed in a given time depends on the humidity of the atmosphere, the temperature range over which the transformer works and the period during which the oil is at the lower temperature.

All outdoor transformers, and indoor transformers subject to the ingress of moisture, should be fitted with breathers. The dehydrating materials most commonly used are calcium chloride and silica gel, both of which have only a limited capacity for moisture and hence require periodic renewal; a monthly inspection of all breathers should be made.

Experience shows that the saturation of the dehydrating material is slower if it is sealed from the atmosphere at all times except when actually inhaling, and oil-sealed breathers are therefore recommended.

Transformer Oils

When overhauling a transformer the first separate samples of oil should be taken from the top and bottom of the tank and tested for dielectric strength and acidity. If the bottom sample is drawn off through the drain cock the first half gallon should be rejected, as this is usually not typical of the bulk. Samples should not be taken until oil circulation has ceased and the transformer has assumed atmospheric temperature. Too much care cannot be taken to ensure that the sample tested is really representative. All bottles should be clean and dry internally and externally and fitted with airtight stoppers. On no account should the oil sample be touched by hand or brought into contact with damp or dirty material.

When the dielectric strength of the bottom sample is low and the moisture content high, whilst the top sample gives a satisfactory test, it is good practice to run off and reject several gallons from the bottom of the tank before commencing the renovating process. If the acid content is not excessive, say not more than 0.015 per cent., the most economical practical treatment is to pass the oil several times through a centrifugal separator fitted with heating elements, and to return the heated oil to the top of the tank. Turbulence should be avoided where the oil is returned so as to minimise mixing. If the acid content is high the oil should be completely run off and returned to the suppliers for treatment.

The transformer should then be washed down with several gallons of fresh oil which should also be run off. Thereafter the tank should be filled with new oil and samples taken for test.

Modern transformer oil has little tendency to sludge, and unless the working temperature is excessive not much trouble should be experienced with recently designed transformers from this cause. The hot spot temperature of a well-designed transformer is at least 15 deg. C. higher than the temperature of the top layers of oil. Sludge commences to form at the hot spots, and being itself a poor heat conductor tends to accentuate the cause so that the presence of even small quantities of sludge may have serious consequences. Sludge in quantity causes rise in temperature due to the more sluggish circulations of oil, and during monthly visits to the sub-station the temperature rise with load should be checked. During overhaul a rough examination of the oil and windings may be made by lowering an insulated hand lamp (shielded from direct observation) slowly into the tank. For routine maintenance it is rarely necessary to lift the core out of the tank.

The tightness of bolted connections should be carefully tried during each overhaul. Owing either to vibration or elongation of screwed stems a fraction of a turn can often be made on connectors even after the transformer has been in service for a long time. Where connections are bolted to insulator stems locking nuts should be placed on both sides of the connector.

During transformer overhauls the following rules must always be observed: (1) all loose articles must be removed from pockets before bending over an open tank; (2) all tools used must be secured by strong tapes to the outside of the transformer tank; (3) no smoking over an open tank.

Earth Connections and Earth Leakage

The conductivity of all earth connections should be measured during maintenance operations to check whether these connections are deteriorating.

A complete overhaul of static plant should be carried out at least once every two years. Hand operation of all circuit breakers—*i.e.*, tripping by relay and closing by hand—should take place once every six months, and inspectional visits should be made to each sub-station once a month.

The monthly inspections should include tests on tripping battery, inspections of transformer breathers, recording of transformer temperature against load, inspection of power fuses for excessive temperature rise and measurement of earth leakage current on the medium-voltage network. On an undertaking where there are about 150 static sub-stations the monthly inspections should provide full-time employment to a semi-skilled man trained to the work.

A systematic programme is essential to success. Experience has shown that a satisfactory method of preserving perspective is to keep a maintenance book in which is entered every item of plant in each sub-station, the names of sub-stations being arranged alphabetically. Columns are ruled to cover a period of, say, ten years. The date of overhaul is entered against each item as soon as the overhaul is completed.

Domestic Cookers. By A Consumers' Engineer

Recent developments in design

DURING the last three or four years there has been a greater increase in the use of electrical appliances than in any similar period, and I believe that this development will be more rapid still during the next similar period. I therefore propose to examine the improvements which have been made in various types of cooking apparatus with a view to seeing whether or not they are on right lines, and, if not, in what way modifications or further improvements should be made. The objective to be kept in mind is that the appliances must give satisfaction to the user in the first cost, appearance, utility and maintenance cost.

The most notable event in this period was the introduction of a thermal storage cooker. Though cookers of this type have been in use in Europe, and more particularly in the Scandinavian countries, for some time, they were of a construction unsuited to English requirements, and an auxiliary oven was needed for baking and roasting purposes. The cooker referred to met most English requirements. Its main disadvantages were the impossibility of getting a "boost" should the stored heat give out during cooking operations on special occasions when the demand was above the normal, and the uncertainty of being able to grill or toast other than in the early part of the morning. Otherwise it was quite capable of doing all the cooking required for a family of six persons.

From the supply undertakings' point of view its chief attractions were its low loading (500 W) and its 100 per cent. load-factor. Even so, unless a very low rate per kWh is offered, the running cost is greater than that of an ordinary cooker and this has retarded its rapid adoption. Nevertheless, it has a definite sphere of usefulness in rural areas and on tail ends of distributors, where perhaps an ordinary cooker could not be taken on.

Improved Lagging and Thermostatic Control

Some further development of this cooker appears to be necessary to make it more "flexible." To do this the 100 per cent. load-factor will probably have to be sacrificed, and this would require a higher kWh rate. It would therefore be necessary to reduce the heat dissipation so as to decrease consumption; this implies improved lagging and some form of thermostatic control. It should not be impossible to produce a cooker along these lines which would give a large proportion of night-time or "off-peak" load, thus enabling a tariff to be offered which would be low enough to compensate for the additional kWh needed compared with an ordinary cooker.

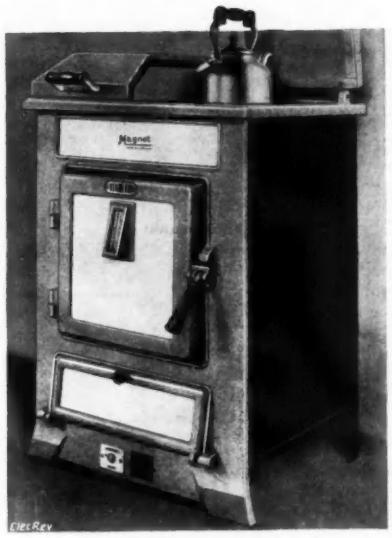
Though I am not in favour of interconnection between cookers and water heaters in the ordinary way, such an arrangement might be of use in connection with a cooker of semi-thermal-storage type, and it is along those lines that development will most likely take place.

Turning to ordinary cookers, there have been two newcomers to the market, and a third previously made abroad is now being made in England. They are all more or less on conventional lines, the only novel feature being that on one of them the housing of the oven elements is provided by means of pockets welded on the oven interior, so that all live parts are kept outside the oven. The object is good, but owing to the difficulty of enamelling inside the pockets scaling with consequent element faults is a possibility. This might be avoided by suitable element construction, but a further probability is the perforation of the pocket within the normal period of the cooker's life. I understand that makers are taking steps to remove any possible troubles which might arise from this cause.

From a buyer's point of view the condition of the cooker five or six years hence is a most important consideration, and only judgment based on experience can guide him. The necessity of visualising this condition is not always appreciated, and has resulted in cookers of apparently good construction and performance *when new* giving cause for dissatisfaction later.

Reductions in Number and Prices

Several makers have dropped out, but there is still a larger number of types than seems economically desirable. The bulk of the cookers are being turned out by a comparatively small number of makers, who, guided by their early experiences, do eliminate from their productions most of the possible sources of trouble. There has been a material reduction in prices, due in part to a general reduction in the number of sizes and finishes, but in greater part to the increased demand. A further reduction, though perhaps not possible at the moment, should follow very soon on the still-increasing demand, and this, of course, will stimulate business to a further extent.



The "Magnet" thermal-storage cooker

The general assembly of cookers has tended towards a reduction in overall width, due to the restricted wall space available in modern kitchens and kitchenettes. This has necessitated a greater depth from back to front. Shapes have really reverted to those of twenty years ago, but with this important difference, that on the old cookers there was no room for switches and fuses, which had to be mounted on a separate board and fixed to the wall of the house, whereas now the switches are incorporated in the width. This has been made possible by the improvements made in the design of oven elements, so that they need much less space in the oven than formerly.

These views show the ease with which the hotplates and supporting frames are removed from the Jackson "No. 65" cooker

Now and again someone suggests that ovens should have glass doors; they were tried many years ago but were not a success. In practice, it was found almost impossible to keep them clear enough to see through, owing to the coagulation of meat and fruit juices, &c. This was particularly so when the ovens were run at higher temperatures than were necessary. Moreover, unless the cooker stood in a position where it faced a light source, one could not see in, even if the glass was clear. To overcome this some makers inserted a lamp in the oven, but the lamps, lampholders and wiring soon failed, due to heat.

To reduce breakage due to the slamming to of doors the size of the glass was reduced, but this only increased the difficulty

of keeping it clean, as one could not get at it with a duster properly. Unbreakable glass is now available, but the other disadvantages remain, including increased heat loss. There should be no need to look into an oven with proper heat regulation. One of the claims made for electric cookers is that after the food has been put in the cook can go away and forget it until the time is up.

Easily Cleaned Ovens

The adoption of welded oven interiors has become universal, but not all makers have made adequate provision for disposing of the moisture given off during cooking operations. The necessity for this was pointed out in an article in the ELECTRICAL REVIEW of December 27, 1929. Removable interiors have practically disappeared. Their introduction was an instance of comparatively new buyers and new makers incorporating something which gave a "selling point," from the point of view of easy cleaning, without considering fully the disadvantages of which the older makers and buyers were aware. These disadvantages were: first, that the larger gross cubic capacity to be heated necessitated either a heavier oven loading or an increased heating-up time, both of which are objectionable, and result in increased consumption; secondly, the removable part, unless of heavy construction, buckled or distorted under heat, and became difficult to get in and out, while if heavily made it further retarded heating up.

Oven elements are more compact than previously, and on the whole are satisfactory. The use of hot cupboards is again general practice. They require height, which has been made possible by greater attention to the "under-the-hob" layout. They have also necessitated the restriction of oven height, and this in turn has resulted in the almost entire disappearance of "top heat" in the oven. Side or side-and-bottom heating is now predominant. There is room for improvement in most hot cupboards, first by making them more nearly airtight, and secondly by protecting them from the spillage resulting from boiling over of vessels on the hotplates. The two defects are really very much one and the same, particularly on cookers with sheathed ring-type boiling plates, unless adequate drip-trays are fitted. The backs of cupboards are in some instances only partly filled in.

Solid or Open Plates?

Solid hotplates have been vastly improved in speed, efficiency and reliability. Their thermal capacity has been reduced, making them more flexible than before. From the user's point of view they are still not flexible enough, and special pans are needed to obtain best results. The latter is a serious disadvantage. Though the crowning of plates and the distortion of pan bottoms has been very largely eliminated on certain makes (provided neither are abused), both of these defects still occur to a small extent, and when in conjunction the effect on the user is bad.

The open type of plate is still wanted. There is one known to me which gives promise of being useful, but the method adopted for housing it in hobs is cumbersome. Though present-day solid plates are good, a good open one will be better, as it will have low thermal capacity, flexibility, psychological effect, and will not need special pans.

The low-voltage hotplate has been improved by increasing its heating area and reducing the element temperature. It is still comparatively dear and space is required for housing the transformer, which cannot be conveniently found. This plate has also been developed as a grill-boiler, the general lines of which are sound, and the construction and assembly are clean and sensible. Another maker has also developed a low-voltage plate, the element temperature of which is rather lower, and should therefore remove the risk of burning of thickened substances in pans. It suffers from the same disadvantage as the other hotplate with regard to the accommodation of the transformer.

Grills are very definitely improved. They are now of satisfactory dimensions and the provision of three-heat regulation has increased their usefulness, besides affording a means of heating the hot cupboard. Owing to the restriction of hob areas, combined boiler-grillers are being very generally used. This allows of the removal of one hotplate which would otherwise be necessary, and greatly helps in the layout of the hob. As a result it is possible to bring the other hotplates farther forward than formerly, so that it is easier to keep several pans going on one plate. Though they are not so efficient as a plate designed solely for use as such, the boiler-grillers provide a useful plate at jam-making times and for simmering in large pans.

The development of satisfactory plug-in contacts for plates has enabled all "under-the-hob" connections to be removed to the back or sides. This permits of a couple of inches or so being added to hot-cupboard height and keeps the hot-cupboard space clear of conductors and terminals.

The Fuse Question

Finding space in which to house fuses still presents difficulties to most manufacturers. In view of the reliability of present-day cookers, however, their situation is not of paramount importance. On many of the smaller cookers, sectional fuses have been dispensed with altogether for some years, primarily to save a few shillings in cost, and secondly because of difficulty in finding space to house them in accessible positions. One wonders at times if they might not be dispensed with on larger cookers. The majority of faults are open circuits, which do not call for a fuse, but the main fuses on a large cooker would not clear as easily as those on a small one.

There appears to be no reason why the various parts should not be divided into two groups, say the oven and one hotplate in one group and the grill and remaining plate or plates in the other. As an alternative, why should a three-heat switch not be developed incorporating an automatic breaker such as is becoming popular for other purposes? This would save space, and in the quantities in which they would be needed the cost should not exceed that of supplying and mounting separate switches and fuses. It quite conceivably might be less and, in addition, many unnecessary "fault calls" on the servicing department would be eliminated.

With regard to external finishes, while the newer undertakings are largely using cookers in all-enamel finishes, generally grey-mottled, the older ones are continuing to use bright black frames with white door pads and enamelled hobs. This is partly due to the probability of being inundated with demands for changes of cooker from existing users, and partly to the uncertainty as to the durability of enamels. Gas undertakings jumped at enamel finishes to aid them, as a selling point, against our competition, but they have since come to regret their haste.

For hiring purposes the black-and-white finish is still the most serviceable. Coloured enamels are more reliable than they were two years ago, and for use by consumers who own their cooker, and therefore take more care of them than hirers usually do, there is not much to be said against them.

There is a great deal of dramatic talent in the electrical industry. Here are two examples: Left, G.E.C. players in "Baa! Baa! Black Sheep"; right, the Metro-Vick company in "Hawk Island." **(See page 426.)**

Estate Distribution

The scheme at the Shenley Mental Hospital

ONE of the most interesting and probably the largest, in respect of public electricity supply, cabling and wiring schemes that it has been our privilege to inspect is that at the new Shenley Mental Hospital of the Middlesex County Council, which Their Majesties the King and Queen are to open officially on May 31st. It is situated at Porters Park Estate, near St. Albans, and the section now completed

The Shenley Mental Hospital from the air showing the wide area covered by the buildings and estate

will accommodate over 1,000 patients; eventually 2,000 patients and 500 staff members will be housed.

The hospital is arranged on the block building system with concrete roads flanking and connecting the various buildings. In addition to the nursing blocks, which house up to forty-five patients each, there are, *inter alia*, a nurses' home, maids' quarters, attendants' cottages, a bakery, a kitchen, extensive cold storage rooms and a large recreation hall which will seat over 1,000, in all of which electricity is used extensively. Indeed, apart from hot-water space heating and a small amount of steam cooking, the whole of the services throughout the hospital are catered for electrically.

Electricity is supplied by the North Metropolitan Electric Power Supply Co. at 20,000 V, supply being initially received in a sub-station at about a mile due north of the site. From this sub-station the supply is transmitted at 3,000 V to a site sub-station situated at the load centre. At the main sub-station there are three 250-kVA outdoor transformers and at the site sub-station two 200-kVA transformers under cover. The site sub-station is situated immediately at the back of the main switchroom, and heavy copper bars through the partition wall connect with a set of isolating links behind the switchboard. From these links are connected, by similar means, the bus-bars which are not mounted on the switchboard, but bracketed to the wall behind.

The switchboard was supplied by the Kartret Switchgear Co., Ltd., and is of the dead front cubicle type with nine panels, the main intake panel being at the centre. This is equipped with a fully protected 2,000-A oil switch interlocked with a change-over switch which is brought into operation in the event of current failure or when it is necessary to disconnect the main supply. The change-over switch connects with the main breaker on one side and with a 270-h.p. Diesel-electric standby set on the other side.

On either side of the intake panel are three smaller panels, each equipped with a 300-A oil circuit-breaker. These serve the power circuits. The two outer panels are each fitted with four three-phase circuits, each controlled by a 150-A switch for the lighting and small current supplies. The outgoing cables and the circuit-breakers are four-pole, for the three phases and neutral, the whole cable system being three-phase. All the panels are adequately equipped with kVA maximum demand and watt-hour meters, ammeters, voltmeters, &c.

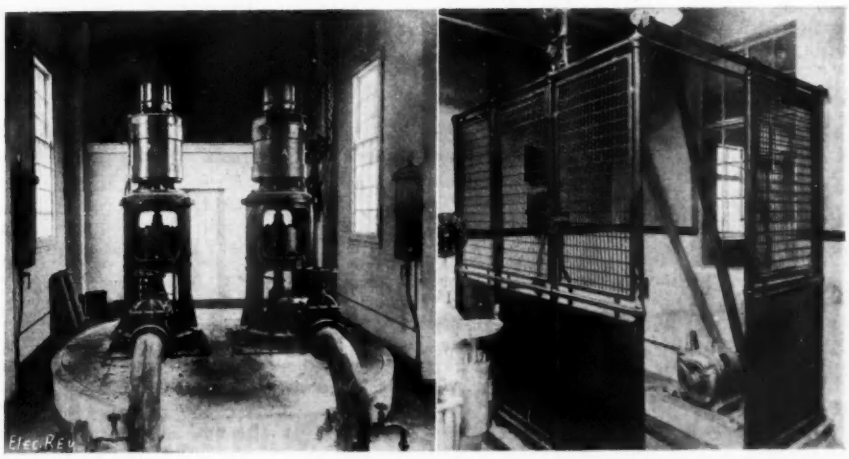
Large Cable Ducts

For the major part of the estate there is a system of underground ducts arranged mainly under the building. A main central duct which communicates directly with the switch-room serves branches which are designed to accommodate ring mains as the estate is extended outwards. There are between two and three miles of these ducts, which are all electrically lighted by shallow ceiling fittings, and the standard measurements are 6 ft. high by 4 ft. wide. They are constructed of reinforced concrete.

There are certain parts of the buildings where the loadings are heavier, such as in the laundry. Cables are run direct from the main switchboard to the building switchboards; but for the other buildings where lighting and small current appliances only are supplied, the cable system is arranged on a reducing principle. To take one instance: from the main switchboard two 0.25 sq. in. cables are taken to a main distribution link box in the duct under one particular block, a distance of 265 yards. From this main link box four cables have been run to smaller link boxes under four other blocks respectively. From the main link box the cables are of about 0.15 sq. in. and are not materially reduced, but the subsidiary link boxes get smaller and smaller in respect of their number of ways. All the cables in the ducts are paper insulated, lead covered, unarmoured and jute served, and are carried on cable racks fixed at 3 ft. 6 in. centres.

The link boxes are of sheet- and angle-iron construction. Horizontally disposed bus-bars are arranged across the full length of the box, isolating links (between arc shields) being connected with the bars and the outgoing cable terminals. The sealing chambers were specially designed for side entry. The boxes were made by Messrs. William White & Co., and the cables by the Hackbridge Cable Co., Ltd.

From the respective link boxes in the ducts cables are taken up to the switchrooms in the respective buildings by similar types of cable, terminating in the bus-bar chambers of the block switchboards. These bus-bar chambers are of similar construction to the duct link boxes except that they have no isolating links. "Simplex" ironclad switch-fuses and C. & H. meters, as well as the bus-bar chambers, mounted on angle-iron framework, make up the block switchboards. The



Left: Motor-driven vertical well pumps. Right: Cable end arrangements for one of the power circuits

switches control the individual circuits, mains being run from them to various distribution boards throughout the blocks from the power circuits. These boards provide for the three phases and neutral, while for the lighting circuits the boards are of d.p. construction. They are of the flush type and have recessed cast-iron boxes with oak door fronts. They also are of William White & Co.'s construction.

The Internal Wiring

The whole of the internal wiring is done with Hackbridge v.i.r. cables run in Walsall screwed conduit, and the whole of the tube work for both power and lighting is concealed. In many cases the underground ducts are used for conduit runs and these, with conduits containing fire-alarm and radio circuits, &c., are supported on extensive cable brackets. Great credit is due to the contractors for some of the particularly neat cabling and conduit runs in the ducts. Approximately six miles of cable in the ducts, thirty-five miles of conduit, and 110 miles of v.i.r. cables have so far been installed.

The heavy power switchboards are, except for size, identical with those serving the blocks and already described. From the switches v.i.r. cables in conduit are run to 30-A ironclad three-phase and neutral distribution boards from which the respective motors, &c., are supplied. This arrangement prevails for all the heavy-current equipment, even for the very large ovens in the bakery (80 kW) and for the cookers in the main kitchen (95 kW).

The whole of the roads are lighted by opal sphere units erected on cast-iron ordinary public lighting type standards, both the standards and lighting units being supplied by the Revo Electric Co., Ltd. There are fifty-three standards of this type as well as special lighting fittings at each of the three main entrances to the institute. Armoured underground cables fed from boxes at various block switchboards serve the standards, and each circuit is controlled by its own Venner time switch.

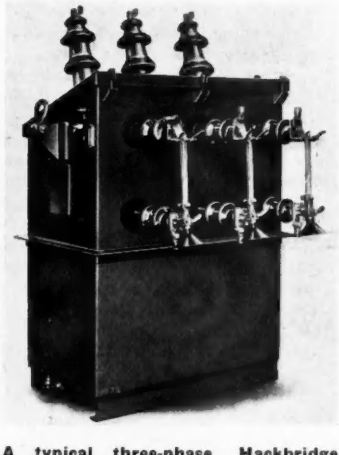
Water supply for the estate is obtained from a deep well from which water is raised by vertical motor-driven pumps to a reservoir about half a mile away, where there is a water-softening plant. From the reservoir other motor-driven pumps deliver the water to a tower 130 ft. high situated at the highest point of the site. To facilitate the working of the well pumps they are remotely controlled from the reservoir. An underground cable from the switchroom supplies the well pumps *via* a feeder pillar situated near the well. Various attendants' cottages nearby are fed also from this pillar distribution unit.

It is estimated that the ultimate load for the hospital will be 800 kW and already a maximum load of 200 kW has been experienced. Every main cable circuit has been balanced across the three phases. With a few minor exceptions the whole of the electrical work embracing the duct cabling, switchboard erection and the internal wiring, including that for the fire alarms, radio service, &c., has been carried out by Messrs. Rashleigh, Phipps & Co.

We are indebted to Mr. W. H. Bray, electrical engineer to the County Council, who has been responsible for the design and supervision of the whole installation, under the county architect, Mr. W. T. Curtis, F.R.I.B.A., for his help in obtaining the above information.

A Compensated Reactor

A NEW reactor has been introduced by the Hackbridge Electric Construction Co., Ltd., Molesey Road, Hersham, Walton-on-Thames, with a view to avoiding an adverse effect on the voltage regulation of the circuit in which it is installed under normal conditions, while providing rapid protection under fault conditions so that the kVA ruptured is reduced to a value that can be safely dealt with by switchgear of moderate size.



A typical three-phase Hackbridge compensated reactor with terminals arranged for an overhead line system

The installation of new high-capacity switchgear, the rupturing capacity of which has become inadequate, due to the rapid expansion of an individual supply system or to its connection to a large interconnected network, is expensive not only because of the cost of the switchgear itself but also of the additional building accommodation usually required. It is claimed that installation of the Hackbridge compensated reactor enables existing switchgear to be utilised or new switchgear of much lower rupturing capacity to be specified.

The compensated reactor normally has negligible reactance and therefore introduces no reactive drop or phase displacement. Under fault conditions, however, it attains its maximum reactance within one and a half cycles—much less time than is taken by the tripping of the circuit-breaker. The normal reactance rating of the compensated reactor is 25 per cent., so that the fault current is almost instantaneously limited to about four times full-load value as compared with ten to twenty times full-load current which represents the limiting effect of a straight series reactor, with which a compromise must be struck between the insertion of a minimum of unwanted reactance during normal operations and of maximum reactance when a fault occurs.

The absence of reactive effect under healthy operating conditions is due to the use of special compensating windings which normally neutralise the reactance. Part of these windings are shunted by a tetrachloride fuse which, clearing under a fault, upsets the neutralisation and inserts the full value of reactance in the circuit. Tests under practical operating conditions have shown that any serious depression of voltage on the side of the reactor remote from the fault is prevented, and that the falling out of step of synchronous machinery is also avoided. The compensated reactor is fitted with an auxiliary potential winding energised, immediately a fault occurs, by the main flux of the reactor. A supply of secondary energy is thus made available for operating tripping circuits, &c.

The overloading of the current transformers incorporated in the older types of switchgear is a common cause of uncertainty in the operation of protective systems, but compensated reactors limit the current through the current transformers to a definite maximum, thus contributing to the dependability of the protective gear. Furthermore, since the compensated reactor is normally designed with a fault current rating of as long as 30 seconds, the graded time protective relays in even an intricate system can be set with ample time separation, permitting accurate selection of the faulty section.

The Hackbridge compensated reactor is supplied in single-phase units or as a three-phase unit with all phases in one tank. The tetrachloride fuses can be replaced on load. The reactor is designed on transformer principles. Consequently there is no heavy leakage flux which might cause heating of the tank or of surrounding steelwork, or interference with magnetic apparatus. Due to the low leakage flux and to the magnetic shielding provided by the steel tank it can often be located in more convenient positions than would otherwise be possible. The core and coils are oil-immersed in a robust sheet-steel tank which is of weatherproof construction so that the reactor is suitable for outdoor as well as indoor operation. The windings are rigidly braced against the mechanical stresses set up under short-circuit conditions and are insulated to withstand the heaviest surges.

The compensated reactor is not a fuse-shunted single-winding reactor which is thrown into circuit by switching or other normal operations, for even a small surge will cause a proportion of the current to flow through the shunted inductance, giving rise to a reactive e.m.f. which blows the fuse.

Utilising Surplus Energy

THE engineers at the Danzig electricity supply works, departing from other systems for the utilisation of surplus electrical energy, easily recoverable in the form of electricity, have undertaken the conversion of the excess energy in the form of transportable gases which are said to command a ready sale. The process employed, according to Herr. O. Garbe, writing in a recent issue of the *Kölnische Zeitung*, consists of the decomposition of water by electrolysis. The three-phase current is first converted into d.c. by means of rectifiers, and is then applied to water contained in suitable strong tanks or reservoirs. Hydrogen and oxygen are evolved and the gases are collected in separate containers. The work of electrolysis is continued until the gases have reached the usual pressure of about 150 atmospheres for filling the steel bottles or cylinders.

It is estimated, Herr Garbe says, that the capital outlay on the electrolytic equipment amounts to 150,000 Danzig guilders. As water power is used, it is claimed to be possible to produce the gases at about 0.2 to 0.3 guilder per cubic metre. The retail prices reach up to 1.5 to 1.6 guilder per cubic metre.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

Developments in Long-distance Telephone Switching

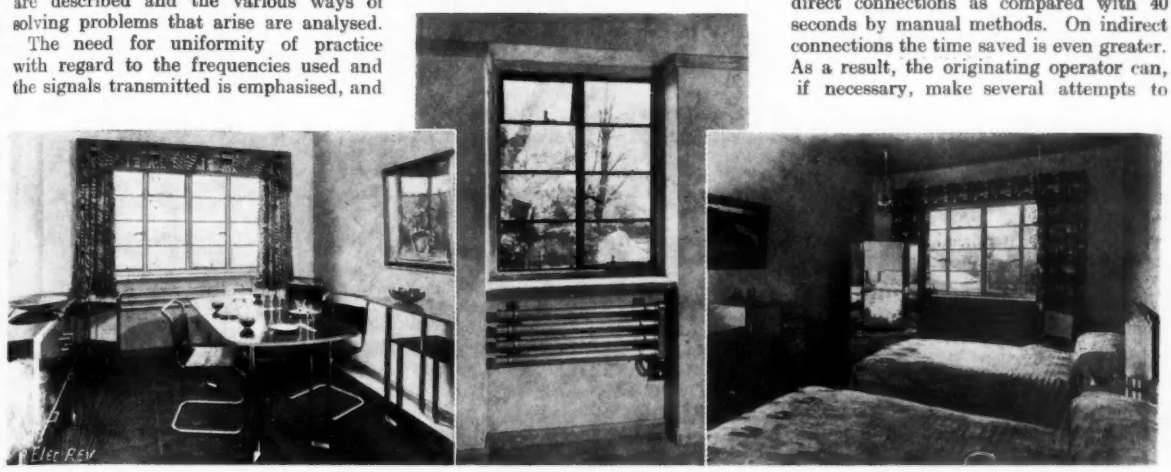
AUTOMATIC methods of making (switching) long-distance telephone connections and the manner in which they affect the design of apparatus and equipment are discussed in the paper by Mr. T. S. Skillman which was read before the Institution of Electrical Engineers in London yesterday (Thursday). One of the most important factors in automatic operation is the signalling equipment; the systems available are described and the various ways of solving problems that arise are analysed.

The need for uniformity of practice with regard to the frequencies used and the signals transmitted is emphasised, and the conclusion is reached that a two-frequency system, preferably using frequencies of 600 and 750 cycles per sec., is probably most suitable for general adoption. It is claimed that future developments will be hampered to the minimum degree by such a system.

Switchboard developments are indicated and it is explained how tandem exchanges, which replace through positions on long-distance switchboards, enable a distant operator to build up indirect connections over a number of long-distance lines by dialling or key-sending.

The effect of modern developments on existing operating methods has been an improvement of the order of 12 per cent. in the earning power of long-distance lines. Substantial savings in operating costs are also realised owing to the elimination of incoming positions and an increase in the traffic-carrying capacity of outward positions. The line time required to obtain ringing tone or busy tone is about 14 seconds on direct connections as compared with 40 seconds by manual methods. On indirect connections the time saved is even greater. As a result, the originating operator can, if necessary, make several attempts to obtain a subscriber in less time than one previously took.

The problems which arise in introducing automatic switching methods into existing long-distance networks are considered and resultant changes in routing methods, cable lay-outs, and transmission lay-outs, for long-distance lines are described. Subscriber-to-subscriber dialling over long-distance lines with time and zone metering is already in operation in several countries. Methods for realising this and the precautions to be taken with a view to its ultimate introduction in less fully developed areas, are described.



One of the new luxury flats at West Hill Court, Highgate, which are equipped with low-temperature heating apparatus, electric water heating and efficient lighting. (See note on page 424)

The Mechanics of Electrical Switchgear

IT has been said that the design of switchgear is 90 per cent. mechanical engineering and 10 per cent. electrical. In the paper by Mr. H. Trencham which was read before the Institution of Mechanical Engineers in London on March 16th, an attempt is made to analyse the factors which have helped to maintain the price of medium- and high-voltage switchgear at a level which appears to compare unfavourably with that of many other mechanical products.

There has been evolved what the author considers to be a rational concept of switchgear in mechanical units or entities, and he believes that future success in development will, in a large measure, depend upon the extent to which adherence to this fundamental idea is maintained. The number of breaking-capacity ratings is too great at the lower end of the range, resulting in too many frame sizes. This follows because, in designing a typical circuit-breaker for, say, 11 kV, its dimensions being settled by consideration of electrical clearance and conductivity, there is now no difficulty in providing a breaking capacity of 100 to 150 kVA. Reduced breaking capacity, therefore, results only in lightening the breaker and framework, and not in producing smaller frame sizes. Combination of several ratings should, in the author's opinion, enable economies to be achieved because the increased manufacturing quantities would outweigh the existing cost differences due to strength and weight. The benefit which could be derived from the greater standardisation both of system and operation thus rendered possible, scarcely needs stressing.

It is hardly too much to prophesy that the minimum economical breaking capacity to build into circuit-breakers will be fixed at some value which will eliminate a number of the smaller ratings, and this will be all to the good. It would be a useful step if all these breakers were operated electrically, from the point of view of ease of operation, personal convenience, and the safety of operators.

One of the main problems is that of correctly applying the fruits of research and discovery to switchgear practice. They could be applied with freedom only to rudimentary arrangements and the study of their possible application to mechanical unit switchgear is hardly begun as yet.

If this main idea is sound, then in the logical development of switchgear the improved device, when it appears, must be regarded as only partially complete, and unfit for commercial use until ways and means are discovered whereby it can be adapted and applied to the main scheme. Only by holding steadily to a principle of this kind will it be possible to say that the mechanics of switchgear is logical and what the world has a right to expect from the engineers responsible for it.

In the course of the presentation of the paper, the author expressed the view that switchgear manufacture was definitely inefficient not because the manufacturers were inefficient, but because the range of choice had been extended beyond what he believed to be the economically sound position. Speaking of the extent to which welded structures were now being used in the manufacture of switchgear and other electrical apparatus, he emphasised the point that the welders engaged on this work must be specially trained because only the most perfect work was permissible.

[*Elliott & Fry*

Mr. H. Trencham is a member of the Willesden staff of the British Thomson-Houston Co., Ltd.

What is Not Wanted

Mr. J. Whitcher, of Messrs. Kennedy & Donkin, strongly supported the author's view as to the need for greater standardisation as a means of reducing the cost of switchgear. He urged that those responsible for preparing switchgear specifica-

tions should not only say what was wanted in a specific case, but should also realise that it was much more important to decide what they did not want. The absence of this realisation led to a considerable amount of worthless development on the part of the manufacturers. Speaking of the relative advantages of the open and enclosed types of outdoor switchgear, Mr. Whitcher expressed the hope that in spite of the many discouragements, designers would remain broadminded regarding the all-enclosed type.

Mr. H. W. Clothier sent a communication, which was read by Mr. Field, in which reference was made to the Reyrolle testing plant. It had been a disappointment to him that efforts made to secure a national testing station of dimensions appropriate to this country had not matured and as a consequence it had been necessary for one switchgear maker to bear the responsibility. The author had under-estimated the cost to the industry of running a testing station. Mr. Birks spoke of the importance to small industrial users of knowing what rupturing capacity should be specified.

Mr. A. G. Hopkins commented on the high cost of making a connection with the main grid lines and said this was largely attributable to the cost of the necessary switchgear. He remarked that the cost of the switchgear for taking high-voltage supply into a sub-station for a suburban railway scheme amounted to 5 per cent. of the total cost of the rolling stock, conductor rails, overhead gear, sub-station power cables, running sheds, and repair shops. Mr. Forster maintained that the already high cost of distribution was tending to increase. Most of the trouble was due to lack of standardisation and the great difficulty of getting a consensus of opinion among the makers, even of small switches. Dr. A. P. Thurston said he had been told by Sir John Brooke that the cost of making a connection to the grid lines was £35,000. This high cost might, perhaps, be a source of satisfaction to the new president of the Institution of Mechanical Engineers (Mr. Charles Day) as it would appear to be cheaper to put in Diesel engines.

Mr. Trencham, in reply to the discussion, referred to the possibility of doing without switchgear and said that by comparison with the effort that had been devoted to increasing the efficiency of turbines and large generators and transformers, the study which had been given to distributing efficiency had been very, very small indeed. The bulk of the cost of distribution was certainly in the switchgear and he believed that if a very much larger measure of standardisation were introduced more, rather than less, switchgear would be used in order to achieve flexibility of control in cases of emergency. He asked Mr. L. Drucquer to speak on the question of the cost of making connection with the grid lines.

Mr. Drucquer said that although in certain cases the cost of making a connection with the grid was of the order of £35,000, it was not always necessary to spend that amount. The cost could be reduced to one-quarter of that where the connection was made with the inter-connecting lines for the purposes of local supply.

Radiant Heat and Comfort

EXPERIMENTS in connection with the provision in the home of an artificial source of warmth to enable comfort to be attained, which have been carried out in the research department of Radiation, Ltd., are described in the paper by Dr. H. Hartley which was read before the INSTITUTE OF FUEL at Manchester on March 20th.

The conclusions reached are that much higher intensities of radiant heat can be borne than are required usually for comfort in a living room. The maximum intensity of heat that can be endured varies with the quality of the energy and, in general, the threshold intensity of pain increases with the penetrancy of the energy relative to human skin. This result is in agreement with Sonne's finding that a higher intensity of visible energy can be borne than of short infra-red energy, and of short infra-red energy than of long infra-red energy.

The threshold intensity for pain is affected by the general condition of the portion of the body exposed to the heat, being the higher the greater the capillary flow and the more moist the skin.

Under the influence of the radiant heat subcutaneous temperatures much higher than blood heat can be attained and maintained. The effect of heat treatment persists for some time after the end of the exposure, and even after the subcutaneous temperature (2 mm. depth) has fallen to about the original value. Sweating relieves pain, provided permanent damage to the skin cells has not been caused.

Single-phase Distribution is Not Obsolete

AT the informal meeting of the INSTITUTION OF ELECTRICAL ENGINEERS in London on March 12th Mr. W. A. Turnbull opened a discussion on "Should Single-phase Networks be Considered Obsolete?" Extensive experience of what he described as the thoroughly successful system of single-phase distribution over 250 square miles in his supply area at Aylesbury inclined him to claim that for low-voltage services polyphase rather than single-phase networks were redundant.

Mr. W. A. Turnbull is borough electrical engineer of Aylesbury

He claimed that where d.c. distribution existed no new service was required, but to cope with the power load that might crop up in an urban district his practice was to run a single-phase line down each side of the street from a Scott-connected transformer and to bring a line across the road to give the consumer two-phase motor supply.

For rural areas and small groups of houses he advocated a single-phase three-wire service which he considered much less noticeable than three-phase lines, while for isolated farms a pair of stranded galvanised steel wires was adequate and economic, for, if the farmer used motors, the additional cost of single-phase machines was about equivalent to the increased overhead charges he would have to bear if a three-phase supply were run out to him.

Mr. Turnbull did not admit any superiority in performance or efficiency of three-phase motors, but he claimed much more ease in balancing consumption on two-phase than on three-phase. He appealed for more freedom from convention and less readiness to scrap expensive and serviceable gear. His method was to ring the area and to make all important feeders three-phase, but to distribute by single-phase using an ingeniously designed tail-end booster to overcome voltage drop at the ends of long lines.

Mr. Turnbull's independent views met with a good deal of criticism in the subsequent discussion. It was pointed out that his problem was very different from that of many supply engineers who might find an area of green fields one day become a populous residential district shortly afterwards—but upon this point also Mr. Turnbull was given whole-hearted support by Mr. Wicks, who described the successful working of single-phase supply in the Bexley district.

Mr. W. E. Bradshaw mentioned the principle of the Ferraris Arno service for groups of single-phase motors. He supported the view that much of the lavish expenditure which was taking place in some districts on the provision of fully automatic sub-station gear was unwarranted.

Overhead-line Wayleave Procedure

MEANS of shortening the delays at present encountered when obtaining wayleaves for the erection of overhead lines are suggested in the paper by Mr. J. A. Sumner which was read before the OVERHEAD LINES ASSOCIATION in London on March 21st. The author's main thesis is that the general conditions, which should include arbitral machinery, and pecuniary compensation are capable of being satisfactorily agreed *a priori* by means of standardisation, and that it is in the interests of all parties to reach such agreement.

He maintains that present statutory procedure is cumbrous and protracted, even when no objection is raised. To expedite the erection of lines he suggests "proceeding by notice" in the following way:—

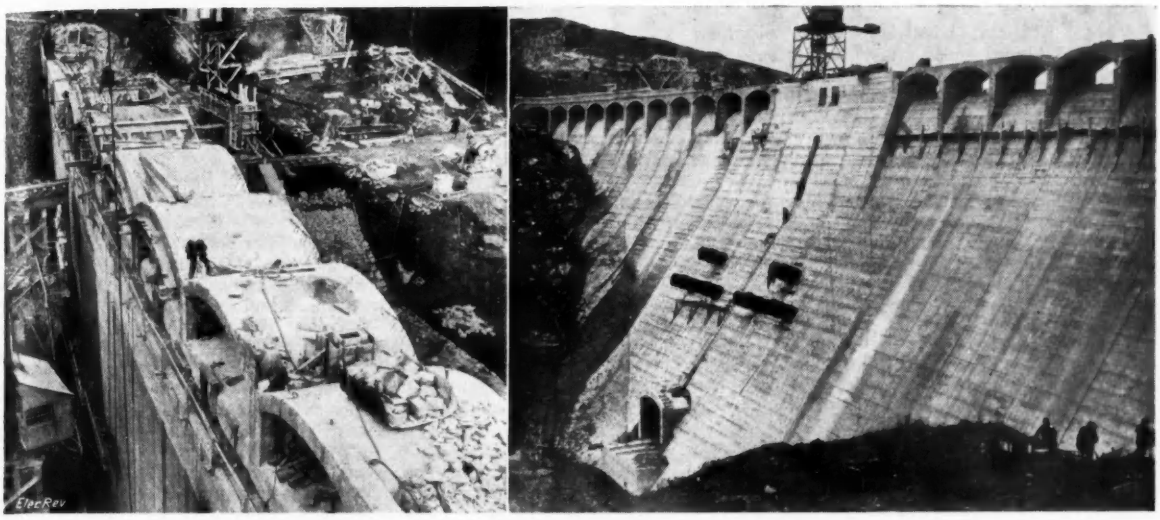
(*i*) A wayleave form, standardised in all its terms, conditions, and stipulations, should be embodied as a part of each Electricity Order issued by the Electricity Commissioners. The monetary terms should be standardised also, but provision made for arbitration on these terms (after the line had been erected) if objection were raised.

(ii) Notices and full details of proposals to be served on all statutory authorities (as at present) and upon all owners and occupiers affected (copies of notice, plans, and all technical particulars of the line to be erected to be sent simultaneously to the Electricity Commissioners for their approval and immediate submission to the Minister of Transport). Non-notification of objection within ten days would imply tacit consent. Two weeks from date of serving notice an inspector and arbitrator appointed by the Minister of Trans-

port would inspect the route, hold a local inquiry if objection had previously been raised, and decide whether the undertaker's proposals were technically sound or likely to conflict with public interests. The Minister of Transport might dispense with the inquiry if he considered it unnecessary, and the cost of inquiry in cases in which objections were not sustained would be paid by the objector (not the electrical industry as at present).

(iii) The Minister of Transport to decide whether the line should be erected, and upon what terms, conditions, and stipulations, within seven days of the local inquiry.

The ultimate standard wayleave form should preferably be of a statutory nature and be issued by the Electricity Commissioners. It should not be lengthy or ponderous, since it need only contain a very condensed summary of terms and conditions which, by hypothesis, would be already known and standardised. The moral effect of such a legally recognised document would be great.



Work is still proceeding with the harnessing of the waters of six lochs to feed a 100,000-h.p. hydro-electric station at Fort William, Inverness. The left-hand picture shows the Laggan Dam under construction; this will hold up a reservoir eleven miles long. On the right is a view of the downstream face of the dam

Is Bare Neutral Wiring Desirable ?

THERE are very clear indications that a departure from the established practice of earthing standard three-phase distribution systems at one point only, *i.e.*, at the power or sub-station, would be very acceptable to one section of the electrical industry, says Mr. T. C. Gilbert in the paper which he read before the Association of Supervising Electrical Engineers in London on March 20th.

Powerful interests are now advocating the additional earthing of all neutral lines upon consumers' premises. From the purely distribution point of view there are many arguments in favour of such a step, and even the Post Office does not now oppose multiple earthing in principle.

[Elliott & Fry

Mr. T. C. Gilbert, M.I.E.E.

The author thinks there is little doubt that official approval will eventually be forthcoming, and the purpose of his paper is to discuss (not very favourably) whether or not approval shall be given to the extension of the practice into the interior installation, by the simple expedient of removing all insulation from the presumably earthed neutral wires of the installation.

Advocates of bare neutral wiring claim a lower cost of wiring in both new and rewired installations by virtue of simplicity and less space required per ampere of capacity; that a definitely polarised system gives greater assurance against reversal of polarity, and that in metal-clad systems the fuse is more likely to blow when a fault occurs in the phase wire, since the neutral is necessarily in contact with the enclosure.

No serious revision of wiring practice would be necessary, though conduit continuity would need greater attention than it generally receives. Severe voltage drop in metal-clad systems where the return current avoids both bare wire and conduit, preferring some lower resistance path, is no doubt due to the inductive effect of the steel conduit surrounding the phase wire; curiously enough, this trouble is cured by the installation of an insulated neutral wire.

Concentric wiring is nearly ideal, but it is mechanically weak, owing to the large number of joints required in the outer conductor. With the general adoption of bare neutral wiring there will be many stray currents seeking to return by the outer sheath, which may conceivably at times have to carry far greater current than the phase wire. Therefore the shock and fire hazards introduced due to metal parts being made alive by reason of an open circuit in the earthed conductor will cause general practice in bare neutral wiring, if and when introduced, to consist of a metal-clad system with a continuous neutral wire run through conduit and boxes in company with the insulated phase wire.

Experience in Germany, the United States, and Australia is reviewed at some length, and the author concludes that, however harmless bare neutral wiring may be claimed to be in towns, or where low-resistance earthing is readily obtainable, he contends that it is absolutely inadmissible for country districts and situations dependent on overhead lines and artificial earthing connections.

The system could not be confined to towns and not permitted elsewhere; it remains to be proved whether the cost of wiring would be reduced in practice; while remedial measures would be difficult and costly in the event of increased stray leakage currents proving to be seriously objectionable to non-electrical interests.

* * *

Scottish Ingenuity

Speaking at the meeting of the Royal Scottish Society of Arts in Edinburgh last week, Mr. J. Eccles, of the Edinburgh Corporation Electricity Department, chose as his subject "A Remote Electrically Operated Wind Direction Indicator." The stator windings of both transmitter and indicator are connected to a.c. supplies of the same frequency, and the rotor windings are connected together by two small pilot wires.

Mr. Norman C. Kemp, secretary of the Society, read a paper entitled "A New Flexible Cassette for use in Radiography," which was produced to facilitate the examination of high pressure steel cylinders constructed by welding. The X-ray film is sandwiched between intensifying screens in order to reduce the time of exposure to X-rays. Normally the "sandwich" is placed in a flat holder or cassette. For the examination of a round article like a cylinder such a cassette is unsuitable, and in a new form, resembling a hot-water bottle, the "sandwich" is placed inside the bag through the open end; the end is closed by a clamp, and air is extracted by a suction pump through a stop-cock, so as to make the sides of the bag close tightly on the sandwich. The combination can then be bent to conform with any particular curvature.

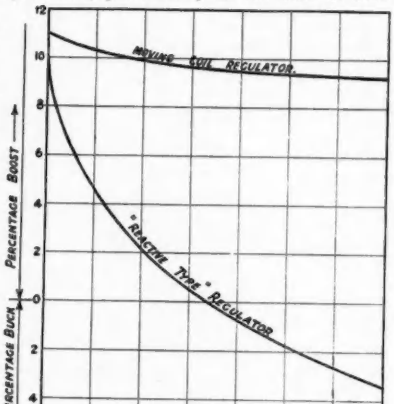
Mr. John Mallinson showed a model of a d.c. electric motor, which he had specially designed for instructional purposes. The parts of the motor could be removed and examined with ease, revealing the action of the motor.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Rural Electrification Problems

I would like to endorse Mr. Charley's remarks regarding distribution transformers and the reactive type of regulator in his article in your issue of March 16th. The serious loss of boost with increased phase angle of load in the latter is brought out clearly in the diagram reproduced herewith in which the curve for the reactive-type regulator is contrasted with a typical curve for the Ferranti moving-coil type. The reactive type has other undesirable features, *e.g.*, the kVA input is a good deal higher than the kVA output and is at a much worse power factor, so that, particularly in the case of overhead distribution, a considerable part of the boost may be lost in increased voltage drop between sub-station and regulator.



Load power-factor and voltage

I must, however, differ from Mr. Charley in his reference to the static balancer. He states that "the function of this apparatus is to relieve the neutral of the out-of-balance current," whereas its real purpose is to minimise out-of-balance in the phase-to-neutral voltages. This purpose will best be served if the neutral conductor is allowed to assist the balancer. Should the neutral be interrupted in the way suggested the balancer must be close to the source of out-of-balance load as stated by Mr. Charley, a requirement which cannot be complied with under modern conditions where sources of out-of-balance, such as cookers, are scattered along the route.

If, however, the neutral is solidly connected this difficulty does not arise so long as all serious out-of-balance load occurs between the balancer and the sub-station. If the conditions are such that a concentrated out-of-balance load may occur anywhere along the distributor and if the maximum allowable voltage drop is 8 per cent. and the balancer regulation 2 per cent., it can be shown that the installation of a balancer with associated choke coil inserted in the neutral conductor will allow of only 42 per cent. increase in out-of-balance load, although a simple balancer at the end of the distributor with solidly connected neutral will allow 129 per cent. increase.

Hollinwood, Lancs, *March 17th.* G. L. Porter.

Engineers and Economics

There is certainly room in many firms for a cutting down in supervisory expenses in these days when degree men with years of experience are working at the bench.

If the wages of workpeople were increased and if there were a prospect of increased earnings with years of service, instead of the prevailing decrease with service, there would be more buying. W. Penstone, Grad.I.E.E.

Leyton, E.10, *March 16th.*

[We have received several other letters upon this subject.—Eds., Elec. Rev.]

The 1934 Electricity Regulations

I have read with interest reports of the O.L.A. meeting at which Mr. Fennell's paper was read and discussed. I understand that no action is being taken by any of the supply undertakers to put their houses in order in compliance with the recent regulations made by the Electricity Commissioners.

While there may be justification for an explanatory memorandum to clear up some of the obscure or ambitious points, some of the undertakers well know that there are installations connected which are utterly unsafe and a disgrace to the electrical profession. It is regrettable that electrical engineers cannot interest themselves sufficiently without legislation compelling the undertakers to safeguard their consumers.

Municipal electrical engineers should leave their office armchairs for a few weeks and make a thorough inspection of some of their consumers' installations; it would be interesting to the ratepayers to see what action was taken following such an inspection. I predict several vacancies for qualified engineers if conscientious reports are made.

Reference has been made in your valuable paper to jerry work on several occasions; this is particularly rife in new housing estates. You cannot write too strongly on existing conditions. Safety First.

March 10th.

Consciousness After Electric Shock

I should be very grateful if any of your readers who have experienced electrical accidents at moderate voltages would be so kind as to send me information. Recently it has become common to use electric shock instead of the humane-killer pistol in slaughterhouses. Alternating current at from 50 to 70 V is applied to the head. The effects depend on the duration of the application, the position of the electrodes and the current strength. If these factors conform to a certain standard the animal becomes inert, and it has been assumed without proof that the inertness is necessarily accompanied by unconsciousness; but unfortunately Dr. Hertz (*Revue de Pathologie Comparée*, March, 1933), experimenting on human beings with currents of weaker amperage but more effective wave-form, found that an effect resembling that of curare was produced—the patient was unable to move or speak, but retained full sensibility.

If any of your readers have received shocks at voltages below, say, 500 and have been rendered inert without losing consciousness, I should be most obliged if they would send me particulars. What I wish to know is (1) the current path—did it pass through the brain?; (2) the probable amperage, or, failing that, the voltage and the firmness, wetness, &c., of the contact; (3) long sensibility endured after the power of movement was lost; and (4) if pain was felt.

Kouyvenhoven has shown that death from shock may be due either to the effect on the heart (fibrillation with weak currents passing longitudinally through the heart, stoppage with stronger currents) or to the effect on the brain, which inhibits breathing. We are here concerned with the effect on the brain only. C. W. Hume, *Hon. Secretary*,

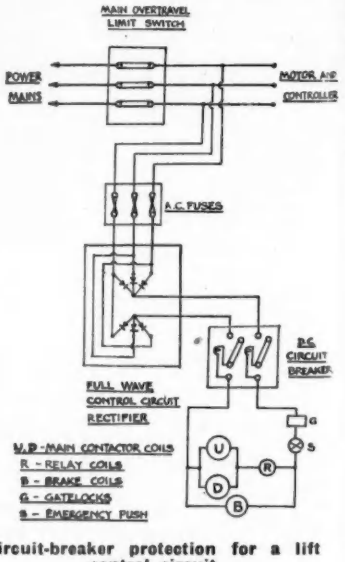
University of London Animal Welfare Society.

London, W.C.1, *March 16*

Lift-control Circuits

In reply to Mr. Patterson's letter in your issue of March 16th I would suggest that he should adopt circuit-breaker protection as indicated in the accompanying diagram. An overcurrent element should be wired in each of the output lines. Circuit-breaker protection for lift-control circuits has never found much favour partly because control currents are very small and there has been no little difficulty in obtaining circuit-breakers of suitable rating, and partly because fuse protection has been satisfactory for early simple circuits.

There is a considerable variation in values of control-circuit current met with in different makers' apparatus, but I think the smallest average is approximately 0.8 to 1.0 A, and there is now a number of miniature circuit-breakers available to cope with a current range of this order. Incidentally, the majority of earth faults occur in gate-lock circuits where the fault current is of a higher value than would be the case for the contingency mentioned by your correspondent.



Circuit-breaker protection for a lift control circuit

In my opinion a great many two-speed lift installations are inadequately protected by fuses. Two-speed machines, especially those incorporated in equipments in which relays are used, should definitely have protection to deal with stalling currents for low-speed and high-speed windings.

The ideal method is to use two independent oil-immersed circuit-breakers of suitable rating, but one circuit-breaker with high-speed and low-speed over-current elements may be used, although the former is preferable since it readily indicates the state of the controller prior to the main circuit being interrupted. It is the practice of the best firms to embody adequate circuit-breaker gear when tendering, though many of these overlook the necessity for individually rated gear on two-speed motors. Some others unfortunately tender without providing for circuit-breakers; in such cases the architect usually instructs his electrical contractor to provide switch-fuses, which, for the reasons stated, are often hopelessly inadequate.

London, W.3, *March 17th.* T. G. Martin.

Electro-thermal Apparatus

In the article on "Electro-thermal Apparatus" in the Electrical Review of March 9th, fig. 1 appears to show a rotary switch at the end of the plate, but not the arrangement of the elements. Surely they are not intended for circular elements in troughs? If so, is the writer not going back to the old design of iron wherein it was the practice to use this type of element?

The usual way of heating such platens as described is by flat elements consisting of nichrome strip, clamped between iron plates and embedded in the platen near the working surface, very similar to the practice with the ordinary flat iron. True, the entire platen in time becomes hot, but this happens with any type of heating, and the heat thus retained is of advantage in keeping the temperature uniform. The chief trouble with such plates is warping, and this can be avoided only by keeping them as solid as possible.

The hot-plate, fig. 2(b), appears to be a good method of obtaining a large contact area, but what happens when the contents of the saucepan boil over? E. H.

March 9th.

Practical Experience Essential

"How much do I get for a penny?" is the question the average potential consumer often asks. In my experience and observation, the reply is generally neither convincing nor correct. The average salesman in electrical showrooms does not make use in his own home, as he should do, of the apparatus which he sells; a knowledge of actual working conditions is essential.

The housewife is not so much concerned with the methods of making a cake, or roasting beef; she wants to know the cost of electric cooking and its advantages as compared with other methods. Every cooker should be supplied with the proper utensils; the cost would be small compared with that of the cooker. Instances constantly occur in which consumers complain that they cannot get the results obtained at the demonstration because of unsuitable utensils. A dissatisfied consumer is a bad advertisement. Each case should be gone into on its merits and there should be an "after service."

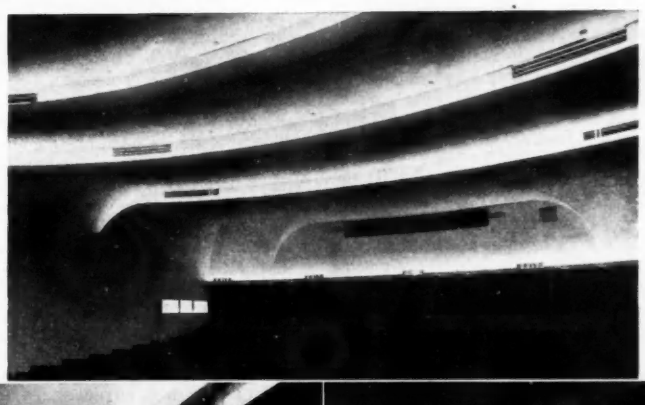
Properly kept detailed records in an all-electric house have shown a saving over other methods. Electrical salesmanship is not anyone's job, but work for the man with technical and practical experience. S. Yerwol.

Erith, *March 17th.*

A Flexible Installation

Builders of high-class residential property are confronted with a difficulty when arranging for the installation of electrical services owing to the impossibility of foreseeing the purchasers' requirements and to the desire to effect any additions to, or changes in, the installation without cutting the house about after completion.

It is hardly a satisfactory solution of the problem to say that the maximum number of points should be put in at the beginning, so that no purchaser, however enthusiastically electrically minded, would find it possible to require any more. It still remains a chance that the purchaser would find them in the wrong place, and the cost of the original wiring would be wasted and floor boards would still be cut about and wall surfaces interfered with. All good builders hate this on new work, and especially in the case of better-class property.



We are at present carrying out an installation where an attempt has been made to prevent unnecessary expense in wiring, and at the same time to make the installation flexible enough to meet changes or any addition to the number of outlets with as little interference to the structure as possible. We refer to a residence now being erected in Mayfield, Sussex, designed by Mr. R. C. Ball, L.R.I.B.A., of Crowborough.

Artistic lighting in the Curzon Cinema, Mayfair, W. **(See page 424)**

The main feature in this installation is the arrangement made for future lighting-socket extensions. The flooring boards are stopped one inch away from the wall line all around the rooms and the skirtings are fitted so that their lowest edge is half an inch away from the floor line. The cavity so formed, measuring 1¼ by 1¼ in., is covered by a capping screwed to the floor and easily removable. All switch conduits come down the walls in the ordinary way to the iron box for the wall switches and continue down to the cavity under the skirting, where they terminate in a bell mouth.

The black or neutral conductor can be taken down through the switch with the red phase wire from the switch terminal to sockets anywhere around the room in cab-tyre or lead-covered wiring by simply removing the capping on the skirting. The number of sockets is limited only by the number of lighting points allowable on the particular circuit concerned. If an earth wire is wanted, it can readily be taken from the lug grip screw on the fitting at the base of the down tube. Thresholds of doors or french windows and fireplaces can be crossed by inserting a bridging piece of conduit from capping to capping in the former case and casting a length of ¾-in. tube in the concrete hearth of the latter, leaving each end of

this tube in the cavity just under the skirting board and running short lengths through the walls. As the cavity is almost 2 sq. in. in section there is ample room for cab-tyre wiring.

This arrangement applies to ground and first floors, but as there is no wiring below switch level on the ground floor in the first instance it will be on the ground floor that the maximum benefit will be felt. On the first floor there is, in addition to the skirting arrangements and bridging pieces of tubing across door and hearths, a generous layout of circular four-way boxes from which conduit is run to lighting positions, switches and fuseboards, and also to the skirting cavities on this floor, making it a simple matter to obtain a feeding point for neutral or phase connections to additional plugs, lights, or switches. Screwed porcelain connectors will be employed in these boxes covered with rubber and black adhesive tape. Traps will be left over all junction boxes.

Tubes ¾ in. in diameter are run vertically from the skirting cavity on the first floor to the skirting cavity on the ground floor and second floor at the best positions for future heating circuits. A way is left through this cavity to the position of the distribution boards, and communication from these is made with the skirting cavities by a suitable number of tubes. One of these tubes could be used to carry loud-speaker and telephone wiring from the ground to the second floor, and the same method is available for bell wiring from the first to the second floor levels.

McConaghy Brothers,
Crowborough, *March 14th.* John McConaghy.

"Free" Cookers Criticised

I was interested to note in your issue of March 9th that Electricity Distribution of North Wales, Ltd., now offers the use of an electric cooker free of all rental and installation charges. If this is correct it is a step that will have far-reaching results in the supply industry and will, I think, eventually be regretted just as the tobacco companies were glad to discontinue their coupon gift schemes.

Cookers are hired on a form of two-part tariff, the rental constituting the fixed charge. Most supply undertakings now recognise that the rentals cannot be expected fully to cover the annual charges on the cooker and installation, especially where gas competition has to be met, and therefore the "unit" charge must bear the difference. It has usually been considered desirable to keep the unit charge of a two-part tariff as low as possible consistent with the fixed charge being acceptable to the majority of consumers, but the present proposal is equivalent to abandoning the two-part tariff in favour of a flat unit charge carrying the whole of the fixed and running charges. This is taking us back to the days of flat rates which most supply undertakings are gradually abandoning.

There is also the psychological effect on the mind of the consumer to be considered. It is well known that an article given away is less appreciated than one that has been paid for. There will be the implication that an electric cooker is an inferior article that cannot be sold or hired and must therefore be given away and also that the price of electricity is so high that the undertaking can afford to dispense with rentals. Will it not also be increasingly difficult to sell or hire other domestic apparatus such as water-heaters, radiators, kettles, &c.?

It is interesting to note the effect of the proposal on the unit charge. The average rental for a medium-sized cooker can be taken as 7s. 6d. per quarter, whilst its average annual consumption is in the region of 1,200 or 1,500 kWh. The rental is therefore equivalent to 0.3d. to 0.24d. per kWh, by which amount the unit charge could be reduced, resulting surely in a considerable increase in consumption, especially by existing cooker consumers who will now have no rentals to pay but no direct inducement to increase their consumption such as would be given by a large decrease in the unit charge.

The company has no doubt carefully considered the cost of the proposal, but according to my rough calculations it would seem as if its cooker consumers will be supplied at an appreciable loss if the present unit charge of 1d. under the two-part tariff is adhered to. I understand that the price paid for bulk supply is in the region of £3 10s. per kW plus 0.4d. per kWh. Assuming that a medium-sized cooker has a maximum demand of 4 kW and an annual consumption of 1,200 kWh and allowing for a diversity factor of 10 for the relation of the individual cooker m.d. to the system peak, the bulk supply cost per kWh amounts to 0.782d. (including a transformation and distribution loss of 15 per cent.). The annual charges on the cooker and installation amount to not less than, say, 0.35d. per kWh. making a total of 1.13d. per kWh for the cost of bulk supply and cooker only. This is already in excess of the selling price and allows nothing for overhead charges (such as sales, publicity, &c.) and capital charges, which latter are likely to be heavy as, if the scheme is a success, considerable capital expenditure will be necessary for strengthening distributors, increasing transformer capacity, &c.

It would be most interesting and instructive to have your readers' views upon the subject. Personally, I feel it is prompted by the desire to expand output irrespective of cost and an impatience with the somewhat slow results of sound salesmanship. Is there not a tendency already in the supply industry to abandon the art of salesmanship and to substitute the art (if it is an art) of "giftsmanship"?

Highgate, N.6, *March 16th.* J. N. R. Perks.

Two Electrical Functions at Manchester

Manchester was a centre of unusual electrical interest last week, for on Tuesday, March 13th, the Manchester Area Branch of the Electrical Contractors' Association held its annual dinner and dance, and on Wednesday the annual luncheon of the North-West Area of the Electrical Development Association took place. At both functions a plea for co-operation between all sections of the industry was the keynote of the speeches.

Speaking to the contractors, Mr. H. C. Lamb, M.I.E.E., chief engineer and manager, Manchester Corporation Electricity Department, said there was no sinister move behind the recent reconstruction of E.D.A. The E.C.A. had recognised that the move was one towards extension, and the principle had been recognised by electrical leaders.

Mr. Joseph Orringe, president, E.C.A., said that his Association was anxious to secure the fullest co-operation. He was sure that E.D.A. and the supply industry would not dispense with such valuable canvassers as they had in the contractors. While he agreed that to meet gas competition it was necessary to hire out cookers, he did not approve of the hiring out of irons and such small appliances. The E.C.A. would support those manufacturers who supported the "Fair Trading Policy." If applied with discretion the new supply regulations would result in refusal to connect up many inferior installations.

Mr. L. C. Penwill said that the whole industry was looking for great things from Sir William Ray, the new executive chairman of E.D.A., who had made a plea for co-operation and team-work. The one main end for all was satisfactory service to the public, and that could not be attained by free gifts. Three sections of the industry catering at the same time for retail distribution represented wasted effort.

Mr. J. H. Farthing (G.E.C.) said that after spending 30 millions sterling on the grid and another 15 millions on the changing of frequency the industry should now be ready for big things. Manufacturers were spending much money on research, and they were sympathetic towards fair trading. Supply men should not forget that they had arrived at their present position largely by the efforts of the contractors.

During the E.D.A. luncheon Prof. Mouat Jones, principal, Manchester College of Technology, who, with Sir Wm. Ray and Miss Clarke, head mistress, Manchester Girls' High School, had been a judge at the E.D.A. public-speaking competition held immediately before the luncheon, presented prizes to the winners as follows: First prize for women, Miss D. Cowen (Manchester Electricity Dept.), "Electrical Service in Modern Homes"; second prize, Miss M. M. Stampe (Cheshire Co.), "Electrical Development as a Factor in Social Evolution"; first prize for men, Mr. G. Sumner (Chester Corporation), "How Electricity is Revolutionising Industry"; and second prize, Mr. J. L. Thomas (Lancs Electric Power Co.), "Electrical Service in Modern Homes."

The Lord Mayor of Manchester (Alderman J. Binns) said that the new efforts of E.D.A. were absolutely essential. He did not think, however, that such keen competition as that between gas and electricity undertakings was necessary. Better services might be given at less cost by co-operation.

Sir Wm. Ray said that probably the most significant thing in electrical affairs was that in a time of unparalleled depression one industry had made steady advance. The Association was going ahead under its new constitution, which had been favourably received in all directions. The remaining need was for co-operation. He was convinced that all were anxious and willing to assist, and he looked forward to the time when electricity would be regarded as the basic means of production. If the E.D.A. Council could look forward to the goodwill of all concerned, then the Association would be welcomed by the whole population.

Mr. C. D. Taite, M.I.E.E., N.W. Area chairman, said they would welcome the manufacturers in the co-operation committees which were to be formed under the new constitution. Referring to recent frivolities by the gas interests, he said that E.D.A. wished to confine its efforts to high-class publicity. The number seated at luncheon, 268, as compared with 221 last year, encouraged him to believe that the 100 per cent. membership attained in the North Eastern Area would be approached in the North Western Area.

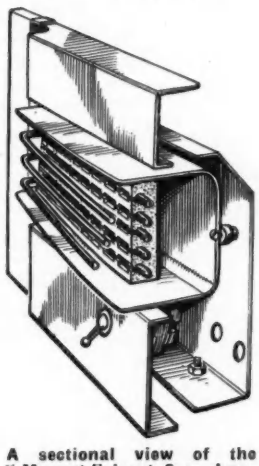
Miss T. Foster Jeffrey, organising secretary, Electrical Association for Women, also spoke.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Specially Constructed Inset Fires

The construction adopted by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, for its recently introduced inset fire is claimed to provide a satisfactory answer to certain objections raised against the installation of "built-in" fires on coke-breeze partition walls. A polished aluminium reflector which covers the back, top and bottom of the element fireclay bars is designed to divert practically the whole of the heat forward and so keep the back of the fire cool. Further, between the back of the reflector and the inside of the shell there is a considerable space for air insulation.

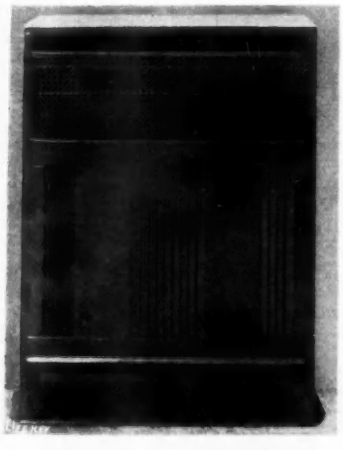


A sectional view of the "Magnet" inset fire, showing the construction. The sketch shows only one half of the fire

The fire is fixed in position by a single screw, and efficient earthing is provided. The elements are controlled by d.p. foot-press switches, and are protected by a substantial front guard. The fires are suitable for fitting to either marble, slate or tile surrounds, and for the last type a special frame which facilitates fixing can be supplied. All models have an into-wall projection of 1⅝ in., and are supplied in 1-, 2- and 3-kW sizes. Antique copper and silver and bright rustless finishes are available.

Improved Air Convectors

The four "MS" models of a new range of "P.H." convectors introduced by MESSRS. GREENE, PHILLIPS & CO., 45, Berners Street, W.1, should prove popular among architects and builders for they all have a back-to-front projection of only 6 in. There are four models loaded at 450, 600, 900 and 1,200 W, the smallest model (MSO) measuring 30 in. high by 18 in. long and the largest one (MS3) measuring 30½ in. high and 40½ in. long.



One of the "MS" convectors

The reduced projection is due to the decreasing of the diameter of the convection coils with a consequent increase in their number for a given loading. They are suitable for placing against walls, beneath windows, &c., and they can also be partially recessed. For complete recessing similar models, styled "MT," are available with curved tops. A variety of finishes and constructions are available.

An Adjustable Reamer

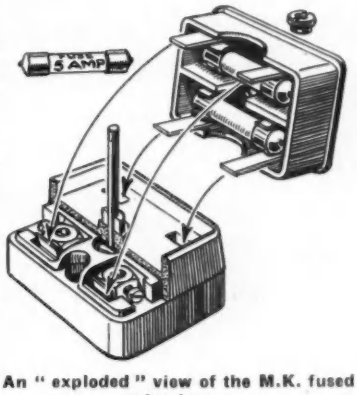
The "Ely-Maxiguide" for which MESSRS. E. L. YOUNGLESON, LTD., 67-69, Chancery Lane, W.C.2, are the sole concessionaires, comprises (1) an expanding reamer extended at the lower end by a round pilot stem; and (2) a self-centring guide with the same expansion as the reamer in which the pilot stem can operate freely without side play. The expanding portion of the guide consists of a three-segment member, the components of which are held together by a flat coiled spring situated in a central groove round the centre of the segments.

The segments are expanded from each end by two cones. The front cone is integral with the bearing body and the rear cone, which is in contact with a milled thumbscrew, is free to rotate. The front cone has three grooves engaging stop pins in the centre of each of the segments, which are thus held equidistant from one another when being expanded, thus ensuring triangulated suspension. It is possible to ream close to the guide whatever the blade setting and even when the holes are close together. The extension piece can be screwed on the top of the reamer to lengthen it when dealing with long holes or holes that are difficult of access.

The same reamer can be used with centre guides of various sizes by the use of different guide rings bored to the diameter of the pilots. It is claimed that as the tool is rigidly maintained in the axle centre, it cannot chatter; that when dealing with holes of different diameters the two axes are maintained in close alignment; and that the reaming of oblique or conical holes presents no difficulty. The price of the "garage set" of three reamers with adaptor rings covering holes of 14 to 25 mm. is £7 15s. An extended range of from 14 to 32 mm. is supplied at £12 15s., or for heavy work from 32 to 60 mm. at £25. Complete reamers varying from 10 to 11 mm. to 50 by 60 mm. can be obtained from £2 2s. 6d. to £8 10s.

The M.K. Fused Point Box

The accompanying sketch gives some idea of the construction of the new M.K. fused point box, which has been designed to make it possible to loop with safety any number of lighting sockets from the nearest power socket. The point box is a particularly convenient accessory for looping out from the live side of the nearest 15-A socket or switch-plug, and then from the point box, two, three, or more 5-A sockets can be connected up without the total load on these looped sockets exceeding the capacity of the fuses in the point box. The general construction is on sound and clean lines, and the fuses fitted can be either 1, 2 or 5 A, and in each case comply with B.S. Specification No. 88 for fuses. The replacement of the cartridge fuse is carried out in a simple and safe way, and the china base is fitted with breakaways to accommodate surface wiring systems. The price is 2s. 4d. complete with two 5-A fuses, and the manufacturers are the M.K. ELECTRIC, LTD., Wakefield Street, Edmonton, N.18.



An "exploded" view of the M.K. fused point box

New Vacuum Cleaners

The new "Sweeper-Vac" vacuum cleaner embodies several unusual features. The revolving brush is driven by the motor through a worm drive reduction gear by a rubber band, and it can be brought into use merely by depressing a button which projects out of the top of the casing behind the motor.

Other conveniences include the self-adjusting nozzle which eliminates a hand adjustment in going from a rug of one thickness to another; a very simple yet positive handle latch and tilting device; and easy handling on the large rubber-tyred steel disc wheels. The flexible tubing is fitted above the nozzle and is held by a single butterfly nut clip. The equipment includes, for the standard price of £16 16s., a polishing mop, wax sprayer and brush, quite apart from the revolving brush, which, by means of a special fastening arrangement may be easily removed for cleaning. The operating switch is at the top of the handle, and a 1/5th h.p. Western Electric motor is incorporated.

The "Sweeper-Vac"

A small hand cleaner known as the "Brush-Vac" is also available at £5 10s. This incorporates an easily removable small brush which revolves at high speed, driven by a rubber band off the fan. The weight is 3 lb. with a 75-W motor. The "Sweeper-Vac" is a £4 10s. hand cleaner in a bakelite casing. In this case no revolving brush is incorporated but there is a fixed nozzle brush, and a special moth gun and blower attachment. The weight is 3 lb. and the motor is loaded at 140 W. This type of cleaner is for cleaning upholstered furniture, cars and stairs. The machines are marketed by MESSRS. W. P. NOTCUTT, 36, Southwark Bridge Road, S.E.1.

Hotel Prepayment Meter

An addition to the range of prepayment meters produced for use with hotel-bedroom fires by MESSRS. FERRANTI, LTD.,

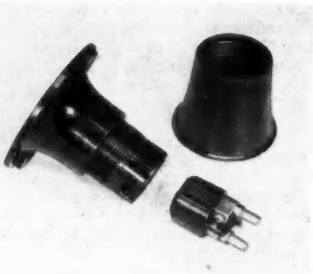
Hollinwood, Lancs, is a new one with an oxidised-silver finish to suit the surroundings. It is essentially the same in principle as the standard house-service meter produced by the company, but it is fitted with a key-operated device for resetting the switch after the departure of a guest.

A Ferranti hotel bedroom fire meter with resetting device

It weighs only 9¼ lb. and measures 9¾ by 6 by 4 in., and it is easy to accommodate and install. It can, with advantage, be mounted waist-high on the wall, making unnecessary the usual stooping to put in a coin. The coin box is external to the electrical mechanism, provision is made for padlocking, and it is entirely proof against fraud.

One-piece Bakelite Lampholders

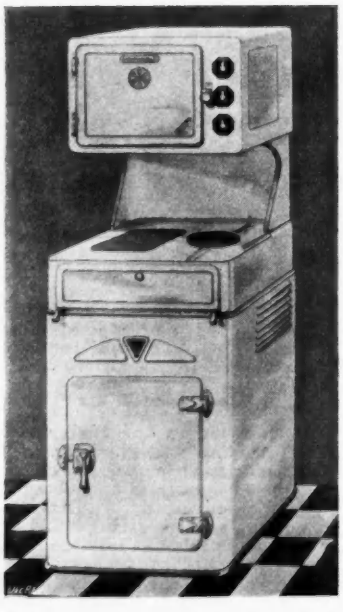
The principle of the "Tunion" bakelite lampholder, which was described in our issue of February 10th, 1933, has now been applied to batten, conduit and chain-fitting holders and adaptors. Each fitting is in one piece from the fixing point to the bayonet slots. The security of the connection does not depend upon screws but upon the grip of the cord by the holder throughout its length, permitting greater weights to be safely supported.


A "Tunion" batten lamp-holder

It is claimed that the holder does not attain a temperature that would permit charring of the leading-in wires, which are separated immediately on entering the holder, or that would burn the hands when changing a lamp when in use. The net trade price per gross of the batten holders is £2 17s., and of the conduit holders £2 15s.; one-switch adaptors cost £1 per dozen. The manufacturer is MR. G. TURNOCK, 41, High Street, Aston, Birmingham, 6.

A Combined Cooker and Refrigerator

The reason for the production of the "Prestcold" combined cooker and refrigerator by the PRESSED STEEL CO., LTD., Cowley, Oxford, is that in many kitchenettes, flats, and small homes there is not room for both a cooker and a refrigerator. The overall dimensions of the equipment are 22 in. wide, 21 in. deep and 65 in. high, and the height from the floor to the hob is 38¼ in.


The "Prestcold" combined refrigerator and cooker

At the bottom, the refrigerator proper has an interior capacity of 3.5 cu. ft. and a shelf area of 6.5 cu. ft. There are two ice trays, accommodating twenty-four cubes, with a capacity of 2 lb. of ice per freezing. The equipment is thermostatically controlled.

Above the refrigerator is a warming cupboard 6 in. high beneath a hob equipped with a 1,750-W boiler-griller and a 1,500-W boiling plate. The oven is overhung at the top above the back splash plate and its cooking space of 12 in. by 12 in. by 11½ in. is served by 1,500 W of side heating. All the elements, oven and hob units, are of the embedded tubular "radiant sheath" type, and they are plugged in. The price is 48 gns.

Two "Sadia" Water-heaters

A further addition has been made to the present range of "Sadia" water heaters by the advent of the 3-gal. type "H" heater designed for use in small barbers' shops, small kitchens and cloakroom basins where the 2-gallon size would be rather too small and the 5-gallon size too big. It works on the free outlet principle and is supplied with a nickel-plated inlet control tap and outlet spout of either straight or swan neck pattern at £6. The loading is 500 W and the measurements are 28 in. high and 10⅜ in. in diameter.

The new "Sadia" 1½-gal. water-heater

The new type "G" thermal storage electric water heater of 1½-gal. capacity is of sturdy build, and several new features have been embodied in its construction. A novel feature is the bottom cover, which is made in two sections, held in position by thumb screws, thus permitting easy access to all working parts. The inner container is of heavy gauge copper in two sections, welded together with copper round the middle of the container. It is tested to a pressure of 100 lb. per sq. in. Element and flow tubes are of tinned copper. The base plate and flange ring are manganese bronze hot pressings. A moulded bakelite ring of large section is fitted in the bottom dish of the outer container to support the base plate and inner container.

A barber's mixing tap can be supplied and, if required to be fixed under wash basins, the heater can be mounted upside down. The inlet and outlet fittings are then reversed, and the space over the elements and thermostat filled with asbestos wool or other suitable lagging material.

The heater is supplied at £4 10s. with a 9-in. fixed swan-neck spout and a 500-W element by AIDAS ELECTRIC, LTD., St. Leonard's Road, Willesden Junction, N.W.10.

The "Locomotive" Clothes Washer

The new "Locomotive" clothes washer sold by the SLOAN ELECTRICAL CO., LTD., 8, Golden Lane, London, E.C.1, embodies a 500-W heater of the circulating type. A ¼-h.p. motor drives a four-vane aluminium agitator through a special moulded "V" belt and pulleys. A speed reduction of 33 per cent. is obtained, and the steel gears are machined to the thousandth part of an inch and completely sealed in oil, which only needs changing once in three years.

The "Locomotive" washer

The automatic locking head gives several positions for the wringer, and a safety device is incorporated which completely releases the top roller. Rubber rollers are fitted, and the tub is in one piece, triple coated with vitreous porcelain enamel and fitted with an anti-splash ring. The price is 25 gns. complete.

Cadmium Yellow Headlight Bulbs

Motor car headlamp bulbs with yellow glass are now being made by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2. This type of lamp is specially suitable for driving through fog, as the yellow glass eliminates the blue rays, which are the chief cause of "back-glare," and yet absorbs only 11 per cent. of the light. As yellow is its natural colour, the glass cannot deteriorate, and the outside of the bulb is quite smooth and does not collect dirt. The bulbs are available rated at 6 or 12 V, in wattages from 24 to 48, and single-filament, bi-focal or the Lucas-Graves dipping types can be obtained. Prices range from 3s. 2d. to 5s.

British Overseas Electrical Trade

THE marked improvement noticeable in January in both the electrical import and export trade of the United Kingdom was again apparent in the statistics published by the Board of Trade relating to last month. The value of exports showed an advance of 21 per cent. as compared with February, 1933, while imports were up 10 per cent.

For the first two months of the year electrical exports increased by £339,054 as compared with the corresponding period of last year, and the total value of imports was £47,846 higher.

The destinations of the four principal classifications of exports are given below, but the following brief analysis of a few of the smaller export items is of interest:—

Destination of rubber insulated electric wires and cables (not telegraph or telephone) during February, 1934, with the February, 1933, figures in parentheses: South Africa, £15,457 (£8,747); British India, £18,514 (£9,980); Australia, £12,844 (£9,097); New Zealand, £2,096 (£4,066); other British countries, £11,079 (£8,034); foreign countries, £5,830 (£4,596).

Insulated electric wires and cables (insulation other than rubber): South Africa, £19,981 (£6,257); British India, £13,854 (£6,017); Australia, £6,928 (£3,829); other British countries, £14,208 (£7,859); foreign countries, £10,845 (£4,382).

Telegraph and telephone apparatus (not radio): South Africa, £6,825 (£16,452); Australia, £12,993 (£4,314); Canada, £955 (£1,342); other British countries, £16,734 (£12,409); Argentina, £12,788 (£2,694); other foreign countries, £26,586 (£39,618).

The imports of electrical goods and apparatus totalling £161,071 came from the following countries (January, 1933, figures in parentheses): British countries, £9,115 (£7,148); Germany, £51,373 (£50,456); Netherlands, £29,425 (£24,742); Belgium, £4,096 (£4,720); France, £5,742 (£6,482); Switzerland, £12,097 (£11,556); Austria, £8,785 (£6,578); United States, £27,741 (£25,807); other foreign countries, £12,697 (£14,456).

Electrical vacuum cleaners were purchased from: Canada, £1,786 (£11,740); Sweden, £7,170 (£3,138); Germany, £564 (£899); United States, £1,230 (£1,186); other foreign countries, £1,622 (£190).

EXPORTS AND IMPORTS DURING FEBRUARY

	Exports.		Imports.	
	Exports for Feb., 1934.	Inc. or dec. as compared with Feb., 1933.	Imports for Feb., 1934.	Inc. or dec. as compared with Feb., 1933.
Submarine telegraph and telephone wires and cables ...	£16,278	+ £13,224	*	
Telegraph and telephone wires and cables (not submarine)	13,536	− 6,352	*	
Other insulated wires and cables	131,636	+ 58,772	£15,880	+ £1,799
Radio receivers (excluding valves)	28,654	+ 14,422	5,573	+ 4,274
Radio transmitters (excluding valves)	31,358	+ 17,023	*	
Radio valves	21,820	− 7,338	14,371	+ 4,301
Other radio parts and accessories	28,716	− 2,378	29,391	+ 6,211
Telegraph and telephone apparatus (other than radio)	76,881	+ 52	*	
Electric carbons	*		13,581	+ 1,784
Incandescent lamps	32,388	− 1,186	8,361	− 1,787
Other lighting apparatus ...	27,637	− 6,036	17,552	+ 1,785
Primary batteries	12,615	− 830	447	− 288
Accumulators and parts ...	59,555	+ 15,436	*	*
House service meters ...	12,498	+ 4,251	20,007	− 6,600
Other elec. instruments ...	11,072	− 1,377		
Unenumerated elec. goods and apparatus	84,989	+ 12,587	35,908	− 2,353
Elec. generators up to 200 kW	17,171	+ 6,122	*	
Elec. generators, over 200 kW	41,093	− 26,204	*	
Elec. motors	50,039	+ 13,758	†22,232	+ 14,340
Convertors and transformers	35,856	+ 2,300	*	
Starting and controlling gear for elec. motors	18,359	− 965	*	
Switchgear	60,766	+ 29,755	*	
Other elec. machinery ...	7,794	− 8,106	6,189	+ 15
Elec. vacuum cleaners ...	*		12,372	− 4,781
	£820,711	+£143,758	£201,864	+£18,700

* Not classified separately. † Not railway and tramway motors.

Re-exports of electrical goods and apparatus last month were valued at £6,475, which was £9,580 less than January, 1933.

BRITISH ELECTRICAL EXPORTS DURING FEBRUARY

Destination.	Exports of electrical goods and apparatus in Feb., 1934.	Inc or dec. as compared with Feb., 1933.	Exports of elec. generators in Feb., 1934.	Inc. or dec. as compared with Feb., 1933.	Exports of elec. motors in Feb., 1934.	Inc. or dec. as compared with Feb., 1933.	Exports of other elec. machinery in Feb., 1934.	Inc. or dec. as compared with Feb., 1933.
Irish Free State	£21,373	+ £5,699	*		*		*	
Union of South Africa	87,502	+ 27,501	£34,632	+ £4,668	£11,468	+ £5,821	£52,769	+ £34,002
British India	89,397	+ 29,408	4,359	− 17,799	8,147	+ 388	31,960	− 156
British Malaya	8,817	− 2,491	*		*		1,095	− 5,180
Ceylon	3,698	+ 1,966	*		*		*	
Hong Kong	17,401	+ 9,469	*		*		*	
Australia	54,165	+ 19,583	1,861	+ 624	2,389	+ 712	1,798	− 2,676
New Zealand	26,193	+ 1,234	*		1,814	− 607	3,473	+ 1,587
Canada	4,961	+ 1,117	481	+ 267	1,922	− 1,204	713	− 3,520
Other British Countries	40,510	+ 6,797	8,304	+ 5,547	6,220	− 1,814	12,341	+ 3,497
Sweden	4,709	− 3,807	*		*		*	
Denmark	22,537	+ 11,825	*		*		*	
Belgium	9,746	− 3,697	*		*		*	
France	8,099	− 6,787	*		*		561	− 1,799
Spain	6,747	+ 4,177	*		*		*	
Italy	18,532	+ 5,348	*		*		*	
Greece	11,863	+ 1,307	*		*		*	
Egypt	11,919	− 3,724	*		*		1,462	− 1,531
China	7,402	− 132	*		*		3,131	− 848
United States	1,164	− 3,857	*		*		*	
Argentina	26,595	+ 13,953	*		145	− 1,364	674	− 2,460
Russia	*		—	− 16,788	—	− 282	226	− 2,709
Netherlands	*		126	+ 106	*		1,178	+ 522
Other Foreign Countries	106,303	+ 12,269	8,501	+ 3,293	17,934	+ 8,486	11,394	+ 2,559
Totals	£589,633	+£127,098	£58,264	− £20,082	£50,039	+ £13,758	£122,775	+ £22,984

* Not separately classified.

E.D.A. Reviews its Work

THE fourteenth annual general meeting of the British Electrical Development Association since its foundation, and the first since it underwent the process of reorganisation, was held yesterday, Thursday, afternoon at the Savoy Hotel, London. The report, which covers the year ended December, 1933, as presented for adoption, devotes its opening pages to a list of members of Council and the interests that they represented under the old constitution from March 17th to September 21st, 1933; also a list of the Council as appointed in September last as well as the personnel of thirteen committees to which specific duties and subjects are allotted, and eight area committees.

The details of the reconstitution being already common knowledge, we need not refer to them now. The Central Electricity Board is contributing a considerable proportion of the funds of the Association, the actual amount from time to time being dependent upon the subscriptions by other authorised undertakers. The Council states that one of the earliest results of the reorganisation scheme is already reflected in a substantial increase in the funds. Thirty-one additional supply undertakings have been enrolled; thirty-eight increased the rate of their subscriptions, and the total contributions of the Supply Section were £57,506, against £31,452 for 1932; but there was a decrease in the combined contributions of manufacturers and other sections from £9,670 to £6,420. The total annual subscriptions were £63,895.

Campaigns and Publicity

Three major advertising campaigns took place during the year—electric water heating, electric cooking, and "The Wizard in the Wall." Nearly 6,000 inquiries were received at headquarters. Regarding the "Wizard" campaign, the Council "is satisfied that the advertising was effective" and that the objects sought were "definitely secured." Other campaigns were planned for the first six months of 1934.

Reference is made to special advertising; the issuance of the monthly sales and publicity programme; the publication of *Electrical Housekeeping*, of the first two issues of which nearly 250,000 copies were sold; the local electrical handbook; posters; and the use of E.D.A.'s processional car for summer carnivals by thirty-one members.

Sales of literature, posters, window displays, &c., brought

in £10,000, an increase of nearly 100 per cent. over 1932. The public-speaking competition results are reported and the service rendered by the Association's monthly *Bulletin* is mentioned; it gives attention to sales methods and reports efforts made by undertakings in developing specific forms of load. The increasing editorial attention which the Press is giving to electricity is cited as proof of the growth of public interest in electrical matters, and we are pleased to read that "no opportunity has been lost of challenging allegations in the Press regarding the electrical origin of fires."

Lecture work, exhibitions (the Ideal Home, the I.M.E.A., the B.I.F., agricultural and others), also local exhibitions, all forms of most useful activity, have been energetically pursued and are reviewed. At the Building Centre seventeen additional electrical manufacturers have acquired space. Sixty electrical firms are now showing there. The work done by committees on special subjects, and the holding of training courses for women as well as the salesmanship conferences, are duly reported upon.

We note with satisfaction that the Electric Vehicle Committee has been recently reorganised, and that steps are being taken to support the revival of interest in the lighter type of electric vehicle. Accompanying the report are the official review of the E.A.W. for 1933 and the reports of the E.D.A. Area Committees.

Towards the end of this 36-page report (it was 84 pages a year ago) there is a list of the undertakings who were members in 1933 and brief tables analysing revenue and expenditure. It is shown that 74.2 per cent. of the expenditure is upon advertising, publicity, Press work, exhibitions, lectures, and the production of cinema films. The Area Committees cost 9.2 per cent., and the item of salaries and wages figures at 8.8 per cent.

Electrical and Allied Manufacturing in 1933

Mr. Railing's speech and the annual report of B.E.A.M.A.

MR. M. J. RAILING presided at the annual meeting of the British Electrical and Allied Manufacturers' Association held at the offices in Kingsway on March 15th. We are informed that he stated that the year had been one of intense activity on the part of the administration. The customary close touch had been maintained with all kindred associations and as the welfare of the electrical industry of this country was very closely interlinked with understanding amongst the bodies interested in the industry new methods of co-operation had been explored.

At frequent intervals the Association had been called upon by the Government for advice, and information which had been given had been generally appreciated. The Publicity Department had been bringing home to the industry in this country and to its clients abroad the fact that, in spite of difficult times, great progress had been made, and that the industry had tackled any and every problem which had been put before it. The Association was anxious to demonstrate to the world at large and to buyers all over the world that the British electrical engineering industry was fully capable of dealing with railway electrification and that no need whatever existed for recourse to the experience of other countries.

Grounds for Hope

Last year was not so satisfactory for the electrical industry as had been hoped, especially on the heavy engineering side. As stated in the annual report the completion of the grid work had severely hit the individual manufacturer both with regard to heavy electrical and heavy mechanical plant. There were, however, signs of betterment, not perhaps of the world's condition, but of conditions within the British Empire and of conditions within the electrical industry. The low-voltage side of the industry had already shown definite signs of improvement and there could be no doubt that in this section this improvement would be maintained. On the heavy engineering side, there were also indications of revival, though the time-lag in the response to improvement in the economic condition of the country as a whole was naturally very much greater. Collieries, steelworks, shipbuilding, and other basic trades were doing better, but before they started to spend money freely on improvements in their plants they were naturally anxious to have another six months behind them. But even in these industries, particularly in the Dominions, there were welcome signs of improvement.

Mr. Railing said that much good had been done by welding together the relationships within the Association and by making them stronger than they were some years ago. He believed that there was a very much better understanding existing now than was the case some years ago, but this spirit of mutual understanding should go much deeper. The world to-day was undergoing changes such as had never been seen before. Some of the most important countries in the world were introducing autocracy in the management of their political and commercial affairs. It was unthinkable that the mentality of this country would permit the type of state interference which was to-day in force in other countries; but autocracy appeared to be fashionable. The speaker urged all members of the Association to make up their minds to work even more closely as a team, to pull together to solve difficulties within their own house and to present a united front.

Mr. G. H. Nelson seconded the adoption of the report and accounts and the motion was carried unanimously. The chairman announced that the following had been elected by ballot to fill vacancies on the Council: Berry's Electric, Ltd., Brookhirst Switchgear, Ltd., J. A. Crabtree & Co., Ltd., English Electric Co., Ltd., Metropolitan-Vickers Electrical Co., Ltd., and Allen West & Co., Ltd.

As the Council's report is for the year ended September 30th, 1933, one has to carry one's mind back to six months ago, though developments of later date are included in the text here and there. In reviewing the trade position it is stated that while the cessation of political debt payments stimulated world trade to a certain extent, especially in the last few months of the year, British electrical manufacturers (in common with those of other countries) probably passed in 1933 through one of the worst phases in the history of the industry. Nevertheless, they were able to resist the effect of the various crises more effectively than their competitors in the world market. Compared with 1932, a distinct revival occurred in the export market for heavy electrical machinery, but there was still considerable leeway to make up before the volume of production for export of 1930 (a year of decline) would have been attained.

In the home market the cessation of orders for heavy plant placed by the Central Electricity Board, caused a serious drop in new business, although the downward sweep was being gradually arrested. It was anticipated that, with the continuance in the improvement in world markets during recent months, industrial electrification would receive a much needed impetus. There were still few signs, however, of the adoption of a national programme of railway electrification, which was a matter for regret, as it was unlikely that prices would ever again be so low.

In the various branches of heavy manufacture, business was rather uneven. D.c. and a.c. generator production remained at the same low level as in 1932. New converting plant fell by almost 50 per cent. Large turbines recorded a very considerable decline, but small turbine orders rose by nearly 30 per cent. Switchgear orders continued to fall, especially in the early part of the year, but some recovery took place towards the end. Transformer business showed an improvement, but prices remained unsatisfactory. Large motors fell by about 33⅓ per cent., while industrial motors declined by about 10 per cent. In nearly all sections prices were unsatisfactory and left little margin for the financing of research and other essentials to technical progress.

Smaller Apparatus Forging Ahead

Manufacturers of smaller apparatus experienced a continuation of public demand which not even the slump seemed able to affect. Extensions of connections in domestic supply resulted in a good year for meters, accessories, and heating and cooking apparatus and domestic appliances; though (particularly in the case of accessories) foreign competition, at excessively low prices for inferior quality products of doubtful safety and design, resulted in a considerably higher volume of importation than in 1932. Import statistics show that since the effective Abnormal Importations Duty of 50 per cent. was replaced by the ineffective duty of 20 per cent. in April, 1932, accessory imports have, on the average, almost doubled in value. In plain fact, the industry is not even obtaining that share of the expanding home market which it obtained in 1924.

The decline in the demand for heavy plant was reflected in a fall of 4 per cent. in the number of insured persons in the electrical engineering industry. But the growing popularity of electricity was visible in the increased number of workers employed in the lighter sections.

The outlook for electrical manufacture in general was, on the whole, promising. The trade cycle appeared to have passed its nadir, and the rapid penetration of electricity into all branches of economic activity must, in the long run, lead to an increasing demand for electrical products. In the home market, demand for heavy plant was for the moment very low, but was improving in the export market, where a better

demand for plant units of larger capacity was visible. Lighter apparatus, on the other hand, was experiencing some freshening of demand in the home market, but the export situation was still unsatisfactory.

International trade relations still leave much to be desired, a number of countries having adopted import quotas in addition to tariff barriers and exchange control. The world monetary chaos has still to be dissipated, and it is impossible to determine when it will be replaced by stability, the results of the interesting experiments of the United States Government having yet to assume a definite form. British industry will, however, require to be guarded against any over-valuation of sterling when the period for international exchange stabilisation arrives.

With such qualifications, prospects for a gradual trade improvement are by no means gloomy, especially as raw-material prices, and, consequently, the purchasing power of primary producing countries, are rising. We may even look with some confidence to the present year as one which will witness the final passing of the nightmare of industrial depression.

Other matters reviewed in the report are: The Australian Tariff Board; the work of the Association delegate (Mr. H. C. Siddeley) in Argentina; the Revising Committee on contract matters; the Tariff Committee (Export); the Electricity (Supply) Bill, 1934; the Merchandise Marks Act; the work of the Economic, Statistical, and Publicity Departments; the Fair Trading Policy; the work of the Education Committee and of the Traffic Committee; standardisation; electrical interference with broadcasting; the E.R.A.; the E.D.A.; the I.M.E.A.-B.E.A.M.A. Joint Committee; the World Power Conference; and the formation of a Water-Heater Section in December last.

The Poplar Coal Contracts

SERIOUS allegations regarding the administration of the Poplar Borough Council's Electricity Department are contained in a long-expected interim report by the London District Auditor (Mr. Clement Gibson), issued on Tuesday last.

The main body of the report relates to contracts for the supply of coal to the Department over a period of about six years, during which, it is stated, the Council incurred a loss of at least £50,000. It is alleged that during these six years coal of a quality below that specified in accepted tenders was supplied consistently, the Council being overcharged for this inferior coal by amounts ranging from 3s. 7d. to 5s. 1d. per ton.

The coal was supplied mainly by one firm of contractors, and it is further alleged that, with the knowledge of the late borough electrical engineer, Mr. J. H. Bowden (who died in July, 1933), and his assistant, Mr. F. Tait (now retired on superannuation), six other contractors were induced to obtain supplies from this firm to fulfil their contracts with the Council. The Auditor interrogated the principals of these concerns, and secured admissions that a deliberate deception was being practised at the expense of the Council. It was further shown that during one period the weights of consignments of coal were overstated by from one to ten tons.

Officials' Private Activities

The second part of the report deals with the private activities of the chief officers of the electricity undertaking. It is stated that Mr. Bowden was appointed borough electrical engineer and manager in 1904 at a salary of £400 per annum; during the year ended March 31st, 1933, his total remuneration was £2,011, in addition to which he received a motor car allowance of £243 per annum. Mr. Tait was appointed managerial clerical assistant in 1904 at a salary of £120. He became assistant manager in 1913, and at the date of his retirement his salary was £933 per annum. The Auditor says that it is a matter for regret that it was not clearly stated in their agreements that they were to give full-time service to the Council. It would appear that at no time did the Council have knowledge of their engaging in private practice.

Correspondence which is reproduced in the report shows that Mr. Bowden had been in the habit of negotiating purchases on behalf of friends and others, the transactions including orders for motor cars, petroleum, gramophones and electrical equipment. Particular mention is made of business carried out on behalf of a principal of one of the coal contractors to the Council. He had also acted as consultant to a company in the Poplar area of which the same coal contractor was a director. When the latter's association with the company ceased, Mr. Bowden's appointment as consultant was terminated. Evidence is produced to show that Mr. Bowden also acted as consultant in three other similar cases and obtained equipment on behalf of these concerns.

The next section of the report relates to transactions of the chief officers of the undertaking with contractors to the Council. It is here alleged that three manufacturing concerns with contractual relations with the Council retained Mr. Bowden as consultant and paid him fees in connection with schemes for other electricity supply undertakings. Correspondence with two lamp-manufacturing companies is also reproduced to show that influence was brought to bear upon Mr. Bowden to increase the purchases from them.

The report next proceeds to examine Mr. Bowden's activities in connection with patents in which he was financially interested. The gist of this section is that he used his official position to secure the installation of these inventions in the Council's system as a means of advertising their advantages and that he incurred unnecessary expenditure in this connection.

The Auditor states that "during recent years the time which Mr. Bowden spent at the undertaking was generally confined to a few hours in the morning, and it appears unlikely that the whole of that time was devoted to his official duties." He also utilised the services of employés in affairs entirely unconnected with the undertaking.

It is considered that some of the subordinate officers should have been cognisant of what was going on and have reported the matter to the Council. The Auditor cannot find anything that implicates the Council or any individual member, and he places on record his appreciation of its sense of public duty in inviting an inquiry into the alleged irregularities.

We understand that copies of the report have been circulated to members of the Council and that the document is also in the hands of the Director of Public Prosecutions. Copies may be obtained by the general public (10s.) from the Town Clerk.

The E.D.A. (Northern Counties) Luncheon

OVER 270 representatives of the electrical industry were present at the annual dinner of the Northern Counties area of E.D.A., held at Newcastle-on-Tyne on March 16th. Mr. J. K. Green, chairman of the local branch, presided, and others present included Sir William Ray (executive chairman, E.D.A.), Messrs. R. P. Sloan (North-Eastern Electric Supply Co., Ltd.), J. Y. Fletcher (General Electric Co.), H. J. Brackenbury (Newcastle and District Electric Lighting Co.), A. Andrews (Electrical Contractors' Association), H. C. Williams (Institution of Electrical Engineers), D. M. Buist (Central Electricity Board), H. W. Ashton (South Cumberland Electric Supply Co.), and Miss Rodford (Electrical Association for Women). Proposing the toast of "The British Electrical Development Association," Mr. J. Y. Fletcher stressed the need for still further speeding up the campaign for popularising the use of electricity. Sir William Ray, in reply, said that branches of the E.D.A. all over the country were persuading manufacturers and others to become members of the Association, and it was gratifying to note that the Northern Counties branch already had a one hundred per cent. membership. During the period since the war when other industries had had their backs to the wall the electrical industry had continued to forge ahead. He looked forward to the day when there would be the closest co-operation between all sections of the industry and when the "Electrical Age" would really have been reached.

Proposing "The Guests," Mr. J. K. Green, chairman of the local branch, said the fact that his branch had a membership of 100 per cent. spoke volumes for the enthusiasm and work of the members. The Lord Mayor of Newcastle (Coun. John Leadbitter) remarked that in his opinion the electrical industry was the best organised in the country. Regarding the suggestion that the work of popularising electricity needed speeding up he was of the opinion that excellent progress had already been made and people were becoming "electrically minded." Mr. R. P. Sloan, managing director of the North Eastern Electric Supply Co., Ltd., made a reference to high prices. He said that when prices of a commodity were high the sales were restricted, but when sales were large and gradually extending it was reasonable to say that the price was fair. This was the case with the North-Eastern Electric Supply Co. During the last three years his company had connected up 20,000 new domestic consumers per annum.

After the luncheon Sir William Ray presented awards to Messrs. Ernest Anderson and E. Wiggins in connection with a recent public-speaking competition.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

The Heating of Modern Flats

New luxury flats, known as West Hill Court, have recently been completed at Highgate. Everything has been done to make these flats the last word in modern comfort. In addition to a profusion of power points for the maximum convenience of the occupants, Ediswan "Trinity" electric heating is installed throughout. The equipment includes over 3,500 ft. of tubular, skirting, and panel heaters, with a total of 220 kW, whilst each of the forty flats is equipped with an Ediswan lagged storage water heater of 40 gallons capacity, fitted with a 4-kW immersion heater, thermostatically controlled, and an electric towel airer. The comprehensive nature of the installation may be gauged by the fact that the twenty-two garages belonging to West Hill Court have Ediswan industrial type tubular heaters, the spectators' gallery of the squash racquet court being equipped with the standard type of tubular heaters. In addition, the large cold water storage room tank, situated on the roof, is warmed by tubular heaters to prevent freezing. The fittings for the halls, bathrooms and outside lights for the garages were supplied by the Edison Swan Electric Co., Ltd. These flats have been designed for Osborn's (Highgate) Estates, Ltd., by Mr. W. B. Binnie, F.R.I.B.A., and Messrs. T. Clarke & Co., Ltd., were responsible for the whole of the electrical installation. Pictures of the flats appear on page 413.

Leicester Contractors' Showroom

The Midland Dynamo Co., Ltd., Belgrave Gate, Leicester, has recently built extensive new premises, having an area of 7,000 sq. ft. The ground floor is laid out as a showroom in which a wide variety of electrical appliances are displayed, private radio audition rooms being provided. On the first floor is a lecture theatre and demonstration room, while all floors are served by a lift. The frontage and the main showroom are shown in the accompanying illustrations.

Exterior and interior views of the reconstructed premises, in Leicester, of the Midland Dynamo Co., Ltd.

An Electrical Exhibition at Great Yarmouth

An electrical exhibition was held at Electric House, Great Yarmouth, during last week. The whole show, which was organised by Mr. P. E. Rycroft, borough electrical engineer, was staged on the premises of the Electricity Supply Department. In the entrance hall were working machinery models (silk stocking and clothing making) and exhibits of woodworking and fish canning. The second section consisted of a display by well-known manufacturers, including the Revo Electric Co., Ltd., the General Electric Co., Ltd., the British Vacuum Cleaner & Engineering Co., Ltd., Frigidaire, Ltd., L. G. Hawkins & Co., Ltd., and Berry's Electric, Ltd., the third section being devoted to cooker demonstrations arranged by the Jackson Electric Stove Co. In the basement a novel show was arranged to demonstrate soil heating, plant propagation and chicken rearing. The attendance exceeded 13,000, and business accrued to all departments.

The Marking of Goods Entering the United States

The Federation of British Industries has forwarded to the Board of Trade a letter asking that representations should be made to the Government of the United States requesting that the existing regulations with regard to the marking of goods entering the United States should not be altered. The alteration proposed by the U.S.A. Treasury decision of February 8th is due to come into force on May 9th next and is to the effect that the marking required shall include the name of the country of origin. This means that the marking of merchandise with the names of the capital cities will no longer be legal after this decision becomes effective, and it also appears that the names England, Ireland, Scotland and Wales will no longer be legal. So far as can be ascertained, these countries would be defined as the United Kingdom of Great Britain and Northern Ireland. Objections to the proposed amendment are raised on the grounds of cost, the short time allowed for the remarking of stocks, and the fact that duplicate stocks would have to be kept of patterns not confined to the American market.

The Scottish National Building Exhibition

At the ninth annual Scottish National Building Exhibition opened by Mr. J. A. Arnott, president of the Edinburgh Architectural Association, in the Waverley Market, Edinburgh, on March 14th, there are stands occupied by the Edinburgh Corporation Electricity Department and the Edinburgh Branch of the Electrical Contractors' Association of Scotland, who are co-operating in the exhibition. On the Corporation's stand is a large selection of electrical appliances, and cooking demonstrations are given daily. Messrs. A. Stevenson & Co., makers of "Weldun" boilers, demonstrate their process of electric arc welding.

A New London Cinema

The pictures of the recently opened Curzon Cinema, Mayfair, which appear on page 417 of this issue, show it to be a very well lighted and decorated building. The scheme for the lighting effects was prepared by Mr. Basil Davis, A.M.I.E.E. The scheme is mainly one of concealed lighting by "Osram" lamps which is carried out on a three-colour circuit, and is dimmer controlled. "Magnet" conduit and Pirelli-General cable was used throughout the theatre, as well as G.E.C. switchgear, a secondary-lighting operating system, and remote-control operating equipment. The stage lighting equipment was supplied by the Strand Electric & Engineering Co., Ltd., the stage control board being installed in the operating room. A loud-speaker system is installed throughout the theatre and is operated from the manager's office. Electric clocks were provided by Messrs. Gent & Co., Ltd., the external neon sign by Messrs. Maple & Co., Ltd., and there are a number of "Linolite" fittings in the vestibule. The electrical contractors were Messrs. Troughton & Young, Ltd., and the architects were Sir John Burnet, Tait & Lorne.

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry announces that there will be no "cost-of-living" alteration in wages paid in the industry on the third pay-day in April.

Ex-British Westinghouse Association

The fifteenth annual dinner of the ex-British Westinghouse men was held at the Trocadero Restaurant, W., on March 16th, nearly 150 members attending from London, the provinces and abroad. Indisposition prevented Prof. Miles Walker from presiding, and Mr. G. A. Trube, who was over from Paris, took the chair. Mr. J. C. Whitmoyer, in submitting "The Association," referred to its numbers as the greatest in engineering circles, and to its camaraderie as probably unequalled among any similar "old boys'" societies. Mr. Trube replied on behalf of Prof. Miles Walker. The usual "draw" for life membership took place, and Mr. J. Moon was the winner.

Rural Electrification Problems

Mr. R. M. Charley, the author of the article bearing this title in our last issue, is a member, not an associate member, of the Institution of Electrical Engineers. He asks us to mention that photographs 1, 2, 3 and 4 on page 369 were taken by the English Electric Co., Ltd., figs. 5 and 6 show the Dumfries rural distribution system; while figs. 6 and 7 illustrate British Thomson-Houston Co.'s equipment. The picture on page 371 is also an English Electric photograph and that on page 372 is the property of Edmundson's Electricity Corporation, Ltd.

Trade Announcements

Leda Electric, Ltd., of Oldham Road, Miles Platting, Manchester, have appointed dealers in Birmingham, Liverpool, Nelson, Chester, and Colwyn who will display their domestic refrigerator.

The Metallic Seamless Tube Co., Ltd., is extending its South Wales activities by the establishment of a service depôt at 1, Grove Place, Swansea, which will be officially opened on April 3rd. Comprehensive stocks of conduit tubing, conduit fittings, and all other allied electrical goods will be carried there. Mr. A. Mackrill will be in charge of the depôt.

An Edinburgh Guide

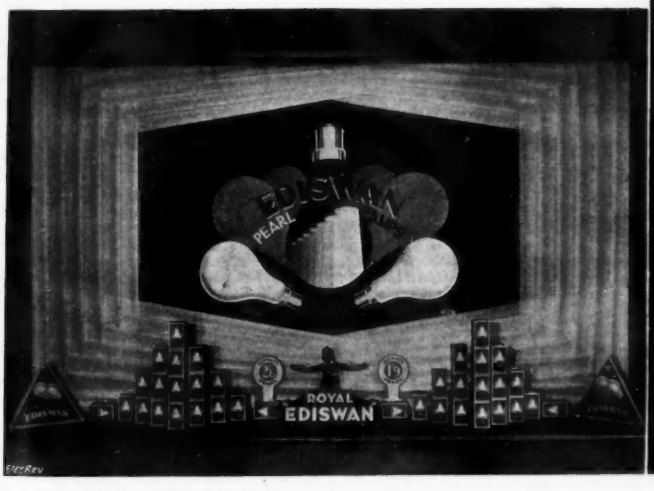
"Where to Stay in Edinburgh" is the title of a useful handbook which has been issued by the City of Edinburgh Bureau for Apartments giving particulars of hundreds of hotels, apartments, and boarding houses, in some cases with charges.

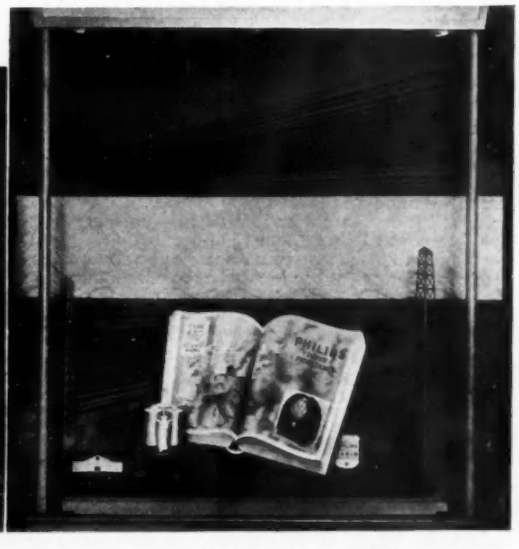
Electrical Window Displays

Electricity supply showroom staffs as well as those who are responsible for the lay-out of the many thousands of shop and store windows of electrical contractors and traders will find it useful to study the accompanying illustrations of actual window displays. They are recent efforts to capture the attention of the passer-by by concentrating attention upon a single line, and of obtaining at the same time a broad poster-like effect. In one case the colours are arranged to suggest brilliant lighting, and in the other, the transmission of wireless messages from point to point. Both displays are the work of a specialised London organisation. In the case of the left-hand display, the major portion of the window space is occupied by the background. Behind the lamps and the name "Ediswan," a plain blue background of crepe is used in order to emphasise the group. The hexagonal formation surrounding the group of lamps is obtained by the simple method of using white crepe pleats. This in itself enhances the suggestion of light, and gives a very sharp, clean-cut appearance to the window. The whole idea is based on the claim that colour sells the goods. The base is in blue, and blue also is used for the sides, left and right.

In the Philips display the object has been to suggest wireless waves. This is done by the simple use of moiré crêpe, of an appropriate design, placed at the back of the two model towers, which immediately suggests movement. The background colour in this case is in sand crêpe, and there are four colours of blue drapes, above and below the centre panel of moiré waved crêpe. The base is dark blue.

Two effective window displays in which crepe paper is largely used





The Tamworth Exhibition

Sir John R. Brooke, C.B., vice-chairman of the Electricity Commission, opened at Tamworth on Tuesday last an electrical exhibition, organised by the Tamworth Circle of the E.D.A. Colonel D'Arcy Chaytor, chairman of the Tamworth District Electric Supply Co., Ltd., presided, and there were also on the platform many well-known personalities of the electrical world. Sir John Brooke expressed his pleasure in associating himself with an electricity undertaking that was showing great enterprise and great success in the common task which they and the Electricity Commissioners had in providing electricity rapidly and cheaply all over the country. Sir John switched on the current to the first consumer in the last remaining parish of the 100 square miles covered by the Polesworth and District Electricity Special Order. The exhibition was arranged on attractive lines.

Mersey Cable Works Extensions

Work has now started on the new buildings which will form an extension of the Mersey Cable Works, Ltd., Bootle.

Recent Contracts

In connection with the proposed extension of trolley-bus services in the Metropolitan area, orders have been placed with the Associated Equipment Co., Ltd., for the supply of two vehicles with which operating experience for the new routes is to be obtained. The new vehicles are a four-wheeled, 60-seat, double-decker, and a 73-seat, six-wheeled, double-decker. The 60-seat vehicle is to have both the electrical equipment and bodywork by the English Electric Co., Ltd. The electrical equipment for the 73-seater will be carried out by the Metropolitan-Vickers Electrical Co., Ltd., and the bodywork by Metropolitan-Cammell-Weymann Motor Bodies, Ltd. In both cases the bodywork is of the all-metal type.

Referring to this contract in the House of Commons on Monday last, Mr. D. Reid asked the Minister of Transport whether, inasmuch as there were several other companies in Great Britain specialising in the manufacture of electric trolley-buses, an opportunity would be given to more than one company to supply experimental vehicles and tender for the supply of vehicles required. Mr. Stanley said that the inviting of tenders was a matter entirely within the discretion of the Board, but he was informed that it was the Board's intention to invite approved firms to tender for the supply of trolley vehicles in the event of the Bill now before Parliament becoming law.

The Chloride Electrical Storage Co., Ltd., supplied the batteries for the new automatic telephone system in Capetown, South Africa. Messrs. Siemens Bros. & Co., Ltd., installed the system.

The Vitreous Enamel Industry

The committee appointed to draft a constitution for the proposed Institute of Vitreous Enamellers has defined the objects of the Institute. These include facilities for the discussion and elucidation of scientific and technical problems arising in all processes involved in vitreous enamelling, the establishment of a registered mark or symbol for the use of firms who are members (for optional use) signifying genuine vitreous porcelain enamel, and the co-operation with other institutes, societies and associations in respect of matters appertaining to the welfare of the industry. A number of well-known electric cooker manufacturers are interested in the proposed institute. A general meeting of the enamelling trade has been called for March 28th at the Chamber of Commerce, Birmingham, and further particulars can be obtained from Mr. J. F. Barry, acting secretary to the Founding Committee, 26, Wharton Street, W.C.

Changes of Address

Messrs. A. F. W. Richards and H. Bright, consulting engineers, are removing to-morrow (Saturday) to 5, Bloomsbury Square, W.C. (telephone: Holborn 6866).

Central Cables & Accessories, Ltd., has removed to 138, Lever Street, E.C.

Radio Sales in 1933

Interesting figures relating to the sales of radio receiving sets and apparatus in 1933 are contained in the 500th number of the *Wireless and Gramophone Trader*, which was published on Friday last. Sales of receivers totalled 967,800 with a value of £14,092,000, while the total sales including batteries and accumulators, components and accessories and valves, was £22,568,000. The increasing popularity of mains receivers is

shown by the sale of 523,000 sets of this type. The most noticeable feature is the fall in the demand for components, accessories and valves, which indicates that the vogue of home construction is on the wane.

Prices of Materials

Messrs. F. Smith & Co. report March 21st: Copper (electrolytic) bars, £35 5s., £1 5s. dec. Ditto, ditto, wire rods, £40, £2 5s. dec. Ditto, ditto, h.c. wire, 7 1/16d., 3/16d. dec. Silicium bronze wire 7 1/8d., 1/16d. dec.

Messrs. Edward Till & Co. report, March 21st: India rubber, Para fine, no change.

Messrs. James & Shakespeare report, March 21st: Copper bars (best selected), sheet and rod, no change. English pig lead, £12 15s., 15s. dec.

Social Events

The G.E.C. Dramatic Society has once again come to the aid of the Infants' Hospital, Westminster, and on Monday and Tuesday last gave two excellent performances at the Fortune Theatre of the popular comedy "Baa, Baa, Black Sheep," by Ian Hay and P. G. Wodehouse. Miss Hilda Case, as Chickie Buff, a newcomer to the Society, is an acquisition and gave a finished performance, while Mr. R. M. Levenger as "Hugo Bonsor" had a part in which he revelled. They were well supported by a strong company, each of whom gave a painstaking performance. The Society was fortunate in having the help of Major J. H. Beith (Ian Hay) in the production of the play, and his encouraging remarks at the conclusion of the show were fully deserved. Mrs. Leslie Gamage was unavoidably absent, but sent a message of thanks to the Society for its work on behalf of the Infants' Hospital, and as all the seats were sold for both performances, this deserving cause should derive substantial benefit.

The North Metropolitan Electric Power Supply Co. held its annual staff ball at the Victoria Hall, Bloomsbury Square, W.C., on March 14th, about 300 members and friends attending. The function was delightfully informal, and the many novelties and prizes contributed towards the success of the evening, a great deal of which was due to Mr. P. A. Thorogood, the social secretary, who was responsible for the arrangements.

A production of "Hawk Island," by Howard Irving Young, was presented by the Metropolitan-Vickers Dramatic and Operatic Society on March 16th and two succeeding evenings at the M.V. Club. The stage setting was remarkably good, and the effects attained a perfection which is only accomplished when a band of young and enthusiastic engineers mean to have everything right. The play itself was "put over" in very competent fashion. One of the scenes in the show is illustrated on page 410.

Electricity in the Home

In the March issue of *Electrical Housekeeping* E.D.A. has published a good deal of useful illustrated propaganda matter in popular form regarding the service, comfort, and economy of electricity in the home. An all-electric home in Toronto, spring-cleaning and the vacuum cleaner, electric cooking, and tubular heating in a film star's house are among the special subjects covered, but there is also a page for the man (the early morning toilet), and an advance account of some of the electrical features at the Ideal Homes Exhibition. The number seems likely to interest "the common people," and that is what is wanted.

A Convector Display

The accompanying illustration shows a display of "P.H." convectors made by Messrs. Green, Phillips & Co., in the

A convector display at the "B. & K." showrooms

showroom window of the Brompton and Kensington Electric Supply Co., Ltd. It was originally intended that the display should be for one week, but it attracted so much attention that it was decided to continue it for a further week.

New Catalogues and Lists

Westbury & Griffiths, 78, Lombard Street, Birmingham.—A catalogue of electrical fittings.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—Leaflets on cadmium yellow car headlight bulbs, and on new lighting fittings.

Wild Barfield Electric Furnaces, Ltd., Elecfurn Works, North Road, Holloway, N.7.—A leaflet on bright annealing by the "O.R.P." process.

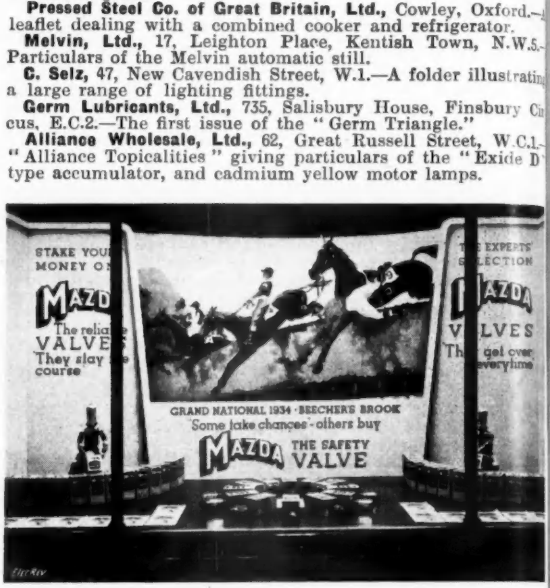
Pressed Steel Co. of Great Britain, Ltd., Cowley, Oxford.—A leaflet dealing with a combined cooker and refrigerator.

Melvin, Ltd., 17, Leighton Place, Kentish Town, N.W.5.—Particulars of the Melvin automatic still.

C. Selz, 47, New Cavendish Street, W.1.—A folder illustrating a large range of lighting fittings.

Germ Lubricants, Ltd., 735, Salisbury House, Finsbury Circus, E.C.2.—The first issue of the "Germ Triangle."

Alliance Wholesale, Ltd., 62, Great Russell Street, W.C.1.—"Alliance Topicalities" giving particulars of the "Exide D" type accumulator, and cadmium yellow motor lamps.



A topical window display at the Ediswan premises in Charing Cross Road, London, W.C.

Crompton-Kye Lamp Sales, Ltd., Bush House, W.C.2.—A leaflet illustrating "Crompton" street lighting installations.

Knightshades, Ltd., 36, Queensway, Ponders End.—A coloured folder on shades, table lamps and floor standards.

British Insulated Cables, Ltd., Prescot, Lancs.—Catalogue of "Rockbestos" stove and range wire and t.h. connection wire.

M. & C. Switchgear, Ltd., Kelvinside Works, Kirkintilloch, Glasgow.—A leaflet describing new starters.

Tube Products, Ltd., Oldbury, Birmingham.—A well produced and profusely illustrated 32-page booklet in art paper on electrically welded steel tubing.

Siemens Electric Lamps & Supplies, Ltd., 38, Upper Thames Street, E.C.4.—A pamphlet on a new sphere fitting.

Klaxon, Ltd., 36, Blandford Street, W.1.—Catalogue of fractional h.p. motors and geared motor units.

Ruston & Hornsby, Ltd., Lincoln.—A booklet putting forward the case for independent oil driven generating plant in garages, &c.

J.P. Tubular Heaters Co., Ltd., Newarthill, Lanarkshire.—Particulars of the "J.P." flexible immersion heater and circulator.

National Gas & Oil Engine Co., Ltd., Ashton-under-Lyne.—Particulars of the "National" engines for cinema lighting.

Cutkill, King & Co., Ltd., 32, St. Mary Axe, E.C.3.—A descriptive pamphlet of "Compulsoree" circulators.

Batwin Electrical Appliances, Ltd., 138, Southwark Street, S.E.1.—A leaflet on the "Batwin" junior flasher.

A. F. Bulgin & Co., Ltd., Abbey Road, Barking.—A leaflet illustrating twenty carded lines.

Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.—Booklets on electric wiring for cinemas, hospitals and municipal buildings, and also recommendations for connecting "Ancalite" neon sign cables.

Bankruptcy Proceedings

J. H. K. Reynolds, "Leylands," Broadstone, late of Poole, Bournemouth, wireless dealer.—The public examination herein was held recently at Winchester. The statement of affairs showed a deficiency of £1,230. Debtor attributed his failure to depression in trade, heavy losses on motor-car transactions and repairs, trading at an insufficient margin of profit to cover trade expenses and personal drawings, and fall in the retail price of goods below the purchase price. The examination was adjourned.

G. S. Elliott, electrical engineer, 70, Rupert Street, Norwich.—Receiving order made March 12th on debtor's own petition. First meeting March 23rd, at 4, Eastbourne Place, Prince of Wales Road, Norwich. Public examination April 10th at the Shirehall, Norwich.

P. R. Slattery, electrical contractor, 26, Cleveland Road, Lytham.—Receiving order made March 12th on debtor's own petition. First meeting, March 26th, at 9, Cannon Street, Preston. Public examination, April 27th, at the Sessions Hall, Preston.

C. A. Whittington, electrician and wireless dealer, 400, Abbeydale Road, Sheffield.—Last day for receiving proofs for dividend April 4th. Trustee, Mr. L. J. Clegg, Official Receiver's offices, 14, Figtree Lane, Sheffield.

B. M. Cowper and **L. J. White** (Mac's Radio), 497, Bristol Road, Birmingham.—First and final dividend of 1s. 11d. in the £, payable March 26th at 159, Great Charles Street, Birmingham.

F. O. Tosswill, electrical engineer, 60, Wodeland Avenue, Guildford.—First and final dividend of 1s. 1½d. in the £, payable March 26th at 4, Charterhouse Square, E.C.

E. Ball, electrical contractor, Old Hall Street, Middleton.—

Supplemental dividend of 2s. 0½d. in the £, payable March 23rd at the Official Receiver's offices, Byrom Street, Manchester.

S. M. Bjornsen, electrical engineer, 31, Pelham Street, Nottingham.—Receiving order made March 8th on a creditor's petition.

T. F. Jarrett (T. F. Jarrett & Co.), electrical engineer, 14, Springcopse Road, and 63, High Street, Reigate.—First meeting March 23rd at 29, Russell Square, W.C. Public examination May 17th at the County Court, Scarbrook Road, Croydon.

J. R. C. August, electrical engineer, 9, Downsview Road, Upper Norwood.—Trustee, Mr. H. W. Sydenham, 1-2, Trump Street, King Street, E.C., appointed March 8th.

C. D. Bruce, electrical engineer, 67, Bold Street, Altrincham.—Trustee, Mr. F. Murgatroyd, Byrom Street, Manchester, Senior Official Receiver, released February 16th.

D. Boulton and **L. C. Turner,** wireless and electrical engineers, Old Town Avenue, Plymouth.—Last day for receiving proofs for dividend March 26th. Trustee, Mr. W. J. Ching, 8, Sussex Terrace, Plymouth.

J. Glickman (Manchester Radio Service Co.), 10, 12 and 14, Great Ducie Street, Strangeways, Manchester.—Supplemental dividend of ⅞d. in the £, payable March 20th at the Official Receiver's Offices, Byrom Street, Manchester.

H. F. Griffiths, electrical engineer, 19, Mount Pleasant, Bilston.—First and final dividend of 3¼d. in the £, payable March 20th at 159, Great Charles Street, Birmingham.

Private Arrangements

W. H. Holmes, trading as the Electrical and Radio Stores, 4, Station Approach, Lancing, Sussex, formerly of Peacehaven.—A meeting of creditors was held on March 12th at the offices of Mr. A. E. Orbell, 6 and 7, Old Steine, Brighton, when a statement of affairs was submitted which showed liabilities of £857 and net assets of £138, leaving a deficiency of £719. Mr. Orbell reported that the debtor commenced business at Peacehaven four or five years ago, and the business there was closed down on March 3rd last. The business at Lancing was commenced on June 1st, 1932. Ten creditors had taken proceedings and County Court executions had been levied on behalf of six creditors. It was decided that a deed of assignment should be executed to Mr. Orbell, with a committee of three of the principal trade creditors.

F. C. Wright, trading as the Wright Electrical Co., 15, Railway Street, Chatham, and 66, Canterbury Street, Gillingham, wireless dealer and electrical engineer and contractor.—A meeting of creditors was held recently at the offices of Mr. P. S. Booth, Kimberley House, Holborn Viaduct, E.C.1, when a statement of affairs was submitted showing liabilities of £655 and net assets of £304, leaving a deficiency of £351. In 1933 debtor incurred a further loss owing to the wiring which had been completed in thirty houses being deliberately cut, and having to be replaced. He attributed the present position to the losses referred to above. It was resolved that a deed of assignment should be executed in favour of Mr. Booth, as trustee, with a committee of inspection consisting of the representatives of Messrs. Baxter and Caunter, Ltd. Hobday Bros., Ltd., and Mr. Blunt.

P. Cohen, 282, Green Street, Upton Park, and 5, Short Wyre Street, Colchester, wireless and electrical dealer.—A meeting of creditors was held in London on March 12th, when a statement of affairs prepared by Messrs. Woodington, Bubb & Co., 64, West Smithfield, E.C., was submitted, which disclosed gross liabilities of £2,429, and net assets of £115, with a deficiency of £1,798. A solicitor informed the meeting that an offer had been received for the Upton Park business of £375, subject to the consent of the creditors. In addition a further £200 in cash would be provided, which would be sufficient to pay a composition to the unsecured creditors. Practically all the £375 received for the Upton Park business would be utilised in paying preferential claims. The suggestion was not acceptable to the creditors, and it was decided that a deed of assignment should be executed in favour of Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C., as trustee, with a committee of inspection.

Company Liquidations

Burrell Radio, Ltd., Perivale, Middlesex, wireless manufacturers.—The statutory meeting of creditors was held in London on March 12th. The chair was occupied by one of the directors of the company, who reported that the usual resolution had been passed for voluntary liquidation. The statement of affairs showed ranking liabilities of £5,130, and net assets of £887, leaving a deficiency so far as the creditors were concerned of £4,243. There was a legal action pending in respect of a sum of £2,000, which was included amongst the cash creditors. The company was registered in October, 1932, with an issued capital of £700. In October, 1933, the capital was increased to £2,500, of which £1,850 was issued. Last November the company was short of capital owing to the business having developed rapidly, but negotiations for more capital were unsuccessful. Creditors began to press and voluntary liquidation had to take place. Although the company was registered in October, 1932, operations did not start until February of the following year. Between December, 1932, and February of the present year, the sales were £4,638. The company started an entirely new business and all the shares which had been issued were allotted for cash. Resolutions were passed confirming the voluntary liquidation, with Mr. C. Latham, 78, New Oxford Street, W., and Mr. F. Harper, Cannon Street, E.C., as joint liquidators.

Collins Brown & Co., Ltd., manufacturers of and dealers in wireless goods, 90-92, New Oxford Street, W.—The statutory first meetings of the creditors and shareholders under the compulsory liquidation of this company were held on March 13th at Carey Street, W.C. A statement of affairs was submitted showing liabilities of £2,308 (ranking £2,062), assets of £97, and a deficiency of £2,264 with regard to shareholders. The company was formed in April, 1933, with a capital of £300. The failure was attributed to lack of capital, excessive overhead charges and a falling market. The liquidation was left in the hands of the Official Receiver.

Brown & Oliver (Wireless), Ltd.—Winding-up voluntarily. Liquidators, Mr. P. S. Booth, Kimberley House, Holborn Viaduct, E.C., and Mr. W. H. French, 21 Cardiff Road, Luton.

Electricity Supply

Australia.—ELECTRICAL DEVELOPMENT IN VICTORIA.—Following his visit to north-east Victoria in connection with proposals for the generation of electricity by harnessing the head waters of the Kiewa and Mitta rivers, Mr. Macfarlan, the State Minister in charge of electrical undertakings, has made a statement which clarifies the position. It seems inevitable, he says, that within the next two or three years, unless the demand of the community for electricity is to remain unsatisfied, the Kiewa plan will have to be seriously considered. The proposal is to benefit not only the north-east parts of the State. It would be part of the general State plan for the supply of electricity. In 1921, when electricity schemes were under consideration, the cost of the Kiewa plan was estimated at £3,000,000, but it is considered that it would now be much more. It was estimated that the completed scheme would produce from 80,000 to 100,000 kW and that it would take three to four years to construct. The reason for the present investigation is that the capacity of the Yallourn station is limited. At present its production is about 100,000 kW, and by changes in the plant this can be increased by about 50,000 kW. As the capacity of other works of the State Electricity Commission does not exceed 50,000 kW, and the peak load last year was 115,000 kW, it is anticipated that in seven or eight years the demand will have reached the total capacity of the Commission. Mr. Macfarlan is to report on the subject to the Cabinet.

PROPOSED PERTH POWER STATION EXTENSION.—In connection with the invitation by the West Australian Government for tenders for plant for the East Perth power station, returnable on April 19th, it is proposed to pay for this by the issue of debentures which will be repayable over a period of fifteen years. One debenture will be redeemed out of the general loan fund each year. The money will be raised in Great Britain and several British manufacturers have expressed themselves as satisfied with the financial arrangements and are to send in tenders.

Ayrshire.—THE ELECTRICITY BOARD'S UNDERTAKING.—The question of the advisability of entering into negotiations for

Chester Corporation Electricity Department is utilising the town's omnibuses to give publicity to the service which it provides

disposal of its undertaking has again been under consideration by the Ayrshire Electricity Board. The matter arose following on renewed representations made by the Power Securities Corporation, Ltd., and, after some correspondence, the Board agreed to meet Mr. George Balfour, the chairman, and Mr. W. Shearer, the managing director, of the company, so that they might have the opportunity of submitting proposals. This meeting was held at Kilmarnock, when Mr. Balfour outlined what his company would be prepared to do towards acquiring the undertaking. The opportunity was taken by the Board at this meeting of investigating and questioning the whole position which would arise in consequence of a transfer. The matter was further examined at a meeting on March 2nd, when the previous decision of the Board was reaffirmed, and a resolution was passed expressing the opinion that it was not in the interests of the consumers or of the constituent authorities that the undertaking should be transferred or sold.

Berkshire.—REDUCED CHARGES.—The Wessex Electricity Co. is to reduce the charges in Hungerford, Faringdon, Didcot, Wantage, Abington, Wallingford, and Pangbourne from 9½d. to 8d. per kWh, and in the rural districts to 9d. per kWh.

Bierton.—ELECTRIC STREET LIGHTING.—Public lighting by electricity has been adopted, and a supply is to be provided by the Aylesbury Corporation.

Bridport.—EXTENSIONS.—The Town Council has received the approval by the Dorset County Council to the extension of its mains to outlying districts, and the work will be proceeded with when the Minister of Transport sanctions the overhead lines. In the meantime prospective consumers in the district are being canvassed.

Brighton.—EXTENSION OF SUPPLY.—The Electricity Committee is to provide a supply at a cost of £4,207, to a housing estate at The Paddocks, Portslade, and also to the Varndean Estate now being laid out by Messrs. Braybons, at a cost of £2,708.

MAINS EXTENSIONS.—The Committee is to extend mains at a cost of £3,353.

Burton-on-Trent.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains from the power station to Curzon Street at a cost of £2,000.

LOAN SANCTIONED.—The Electricity Committee has obtained sanction to borrow £10,000 for mains and services.

Cannock.—SUPPLY TO POTTAL POOL.—The Urban District Council is to give a supply of electricity to Pottal Pool at an estimated cost of £568, on condition that payment of a minimum sum is guaranteed for five years.

Canterbury.—EXTENSIONS.—The Lighting Committee is to spend £10,770 on further extensions of the a.c. mains, and a loan for that amount is to be applied for.

Carlisle.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £572.

SWITCHGEAR REPLACEMENT.—The Committee has obtained sanction to borrow £5,200 for the replacement of obsolete switchgear in certain sub-stations.

Cheadle and Gatley.—DEVELOPMENTS.—Mr. R. W. Willis, the electrical engineer to the Urban District Council, informs us that it has recently agreed upon a scheme for a supply to a new building estate comprising 350 houses in which "inset" electric fires will be fixed in all bedrooms, and this scheme will involve an outlay of £7,000 for plant, machinery, mains and services. A new sub-station is to be erected at the southern end of Cheadle Hulme, and the total cost approved by the Council amounts to £3,600 for plant and machinery and mains extensions. The Council has under consideration the erection of a new showroom with a lecture theatre in the Cheadle Hulme area which will be additional to the existing showroom attached to the central offices in Cheadle, and negotiations have been completed for a supply to a large brickmaking works in the eastern part of the area. There are now 5,000 consumers connected to the system.

Cheltenham.—SUPPLY TO BIRDLIP.—The Electricity Committee is to extend the supply to Birdlip village at a cost of £5,310.

Clacton-on-Sea.—EXTENSIONS.—The Urban District Council is to carry out extensions to Norman Road, Holland-on-Sea, a guarantee as to revenue having been obtained.

Cumberland.—SUPPLY EXTENSION.—Within the next few weeks the Mid-Cumberland Electricity Co., Ltd., is to supply electricity to Newton Reigny, Caithwaite, Plumpton, Thursby, Blencogo, and Waverton. Schemes are also to be proceeded with for supplying Lowca, Moresby, Moresby Parks, Parton, Eaglesfield, Dean and Branthwaite. Up to the present thirty-five villages in the county have been supplied.

Cumbrae.—ELECTRICITY SUPPLY.—The Ayrshire Electricity Board has informed Millport Town Council it cannot undertake to supply electricity at a cheap rate. It states, however, it is willing to provide a bulk of electricity from a point near Largs providing the Council undertakes to lay the cable and pay distribution costs.

Dartford.—LOAN.—The Town Council has applied for sanction to borrow £6,144 for switchgear.

Dorchester.—NEW ELECTRCITY WORKS.—The Electricity Committee reports that the site for the new electrical works at Dorchester has been partially cleared of all buildings, and the borough engineer has been authorised to construct the necessary foundations for the transformers, &c.

Ealing.—WIRING FOR ELECTRICITY.—It has been decided to invite tenders for the wiring of 131 houses on the Townholm Estate.

Falkirk.—SUB-STATION.—The Town Council has been given permission to erect a sub-station at Grahams Road at a cost of £1,000.

Gateshead-on-Tyne.—NEW CABLES.—The North Eastern Electric Supply Co., Ltd., proposes to place underground cables in Florence Avenue, the Grove, Fenwick Terrace, and Split Grove Road, Gateshead.

Glasgow.—MAINS EXTENSIONS.—The Electricity Committee has agreed to the laying of distributing mains at a cost of £1,646.

Great Yarmouth.—LOAN SANCTIONED.—The Electricity Committee has obtained sanction to borrow £1,527 in connection with the supply of electricity to Wrentham.

OBSOLESCENT D.C. PLANT.—The Electricity Committee has agreed that, in view of the abolition of the tramways, the use of certain d.c. plant is no longer economical, and recommends its disposal and the purchase of a new rectifier at a cost of £500 to meet the small demands of those consumers who require direct current.

LIGHTING IMPROVEMENT.—The Lighting Committee has approved a scheme submitted by the borough electrical engineer for improving the lighting of the main roads, at a cost of £6,405.

SUB-STATION.—The Electricity Committee is to provide a sub-station on the Maygrove Estate.

Kettering.—SUPPLY TO CORKY.—Arrangements have been made for the opening of the double-circuit 33,000-V line to Messrs. Stewarts & Lloyds' works at Corky, on Tuesday, April 10th, and a luncheon is to be held to celebrate the occasion. Among those who have been invited are Sir Andrew Duncan, Sir William Ray, Sir John Snell, Sir John Brooke, Mr. P. V. Hunter, Mr. P. J. Robinson, Sir Duncan Watson, Sir Archibald Page and Sir Arthur de Capell Brooke. The proceedings will include a visit to Messrs. Stewarts & Lloyds' new works.

Kirkcaldy (Fife).—NEGOTIATIONS WITH THE C.E.B.—Negotiations have been reopened between the Electricity Department and the Central Electricity Board with a view to Kirkcaldy being supplied from the grid. This development is the result of a letter from Mr. A. E. McColl, manager in Scotland for the Board, claiming that the saving to the Corporation in a bulk supply, as compared with independent generation, would be £1,154. Mr. Francis, the Corporation engineer, states that the present offer repeats the offer of 1932, but there is also an alternative offer to supply the Corporation's requirements at the grid tariff, less a fixed refund to the Corporation of £5,300 for a period of ten years under certain conditions. The Board offers to pay all the expenses of operating and maintaining the generating station, which are at present being allocated in the revenue account under the heading generation, and amounted to £10,960 for the year ended May, 1933. Mr. Francis stated that the Corporation would be compelled to join up with the grid in the early future, since the Electricity Commissioners would refuse borrowing powers for new plant. He was satisfied that the Corporation would benefit financially over the ten years by accepting the offer. The Electricity Committee has delayed its decision until a future meeting, when the matter will be discussed with Mr. McColl in attendance.

Leominster (Herefordshire).—NEW CABLES.—Work is to begin shortly on a scheme costing between £6,000 and £7,000 for the relaying of all the cables in the town. The Leominster Electric Light Co. has just been transferred to the Southern Areas Electric Corporation, Ltd., and the reconstruction is in anticipation of the demand for cookers and other developments. At present the town's electricity supply is obtained from the Shropshire, Worcester, and Staffordshire Company, *via* Hereford. The new owners intend to tender for street lighting.

London.—ST. MARYLEBONE.—The Electricity Committee is to install rising mains to flats and tenements at Boston Street and on the Lilestone Estate at a cost of £1,450.

FULHAM.—The Electricity Committee has decided to provide a sub-station at a cost of £996 to provide an additional supply to Messrs. Bowen & MacGeorge, at the Thames factory, Rainville Road.

Lowestoft.—MAINS EXTENSIONS.—The Electricity Committee is to extend the distribution system at a cost of £7,000.

Macclesfield.—REDUCED CHARGES.—The Electricity Co. of Macclesfield, Ltd., has reduced the flat rate for lighting from 5½d. to 5d. per kWh as from April 1; users of prepayment meters will receive a rebate of 2d. per kWh, charged at 8d., instead of 2d. on each shilling charged, and those using free wiring prepayment meters will receive a rebate of 1d. per kWh in place of ½d.

Manchukuo.—ELECTRICAL UNION.—A beginning has been made in Manchukuo with the union of all electrical undertakings in the country in one company under Japanese control. There are fifteen Japanese electricity undertakings in Manchukuo with a total capital of 54 million yen, and sixty Manchukuan undertakings with a capital of 25 million yen.—*Eastern Engineering and Commerce.*

Middlesbrough.—LOAN.—The Gas and Electricity Committee is to apply to the Electricity Commissioners for sanction to borrow £11,000 for electricity meters and £13,012 for expenditure on the converting plant.

Newcastle (Staffs).—REDUCED CHARGES.—The Electricity Committee recommends a reduction in charges to take effect as from the December meter readings. The lighting charge is to be 4½d. per kWh, with a cash discount of ½d. per kWh for prompt payment. In addition there are various quantity discounts. Consumers taking a supply through slot meters will be charged a flat rate of 5½d. per kWh and a special tariff for off-peak water heating has been instituted. The Committee has also prepared a hire and hire-purchase scheme for water heaters suitable for fixing in existing cisterns.

Paignton.—SUB-STATION.—The Electric Light & Power Co., Ltd., is to erect a sub-station in Keysfield-rd.

Penrith.—SPECIAL ORDER.—The Penrith Electric Supply Co., Ltd., has applied for a Special Order revoking the Penrith Electric Lighting Order, 1900, and amendment Order of 1907, and to cancel the deed of transfer dated October 20th, 1908, between the Penrith Urban District Council and the company, and, *inter alia*, to prescribe and extend or suspend the period within which the Penrith Council may give notice to the company of its intention to purchase the undertaking to be authorised by the Order.

Portsmouth.—STIMULATING THE DOMESTIC DEMAND.—The Electricity Committee has agreed that some consideration should be given to persons installing power points at the time

of the erection of their houses, and for every 15-A power point installed a reduction of 5s. is to be made in the price charged for the service line.

Sub-stations.—The Electricity Committee is seeking sanction to borrow £2,670 for sub-stations, and is to extend mains at a cost of £1,469.

Rawtenstall.—Loan.—The Electricity Committee is seeking sanction to borrow £5,000 for electricity meters.

Sedgley.—Sub-station.—The Midland Electric Corporation is to erect a sub-station in Wolverhampton Road.

Somerset.—New Supplies.—An electricity supply has been inaugurated at Silloth, Skinburness and Abbey Town.

South Africa.—New Cape Scheme.—The municipality of Prince Albert, Cape Province, has been empowered by the ratepayers to borrow £5,500 for carrying out an electricity scheme for the town.

Spain.—Electric and Gas Workers' Strike.—A report from Barcelona states that soldiers, sailors, and members of the Civil Guard and citizen police maintained the electricity supply when the regular employés ceased work last Friday. The "United Front of Light and Power," which is the employés' organisation, has often declared that it aims at gaining the control of the companies for the workers. It has been asking for pensions on a sliding scale, the establishment of an insurance fund, and a share in the direction of the companies. The strike came to an end on Tuesday, both sides having made concessions, and the companies have agreed to take no reprisals against the strikers and to pay them regular daily wages for the strike period.

Sunderland.—Loan.—Application is to be made by the Town Council to the Electricity Commissioners for sanction to borrow £12,184 for the installation of more modern stoking plant at the Hylton Road electricity works. The Council also proposes extending electricity mains in Hemdon Road at a cost of over £700.

Swansea.—Mains Extensions.—The Electricity Committee is to extend mains at a cost of £1,500.

Torquay.—The Electricity Committee is to provide a supply at a cost of £5,550 to Haytor where there are already eighty properties awaiting a supply of electricity. It is also to seek an Order to supply the Inner and Outer Hope districts of Kingsbridge.

Wadsworth.—Public Lighting.—Public lighting by electricity was inaugurated on March 10th. The scheme, which comprises eighty lamps, has been carried out by the Electrical Distribution of Yorkshire, Ltd.

Walton and Weybridge.—Loan.—The Urban District Council has applied for sanction to borrow £8,105 for electricity extensions.

Revised Charges.—The following reductions in charges have been approved:—Lighting: Standard rate, from 5d. to 4d. per kWh.; shop rate, dusk to 7.30 p.m., from 5d. to 4½d., and at other times from 2½d. to 2¼d. Domestic two-part tariff, lighting, heating, cooking, and water heating, from ¾d. to ½d. Meter rents have also been reduced.

Watford.—Electricity Preferred.—A letter has been received by the Highways Committee from the Watford and St. Albans Gas Co. requesting that it be allowed to light one of the main streets in Watford with gas, which it would be prepared to install and supply at cost price, but the Committee reports that it is unable to depart from its present practice of using electricity for street-lighting purposes.

New Cable.—The Electricity Committee is to provide a 6,600-V cable from the power station to King's Langley at a cost of £6,500.

Whitehaven.—Two-part Tariff.—The Town Council has adopted an optional two-part tariff for domestic consumers with a fixed quarterly charge of 1s. per £1 of rateable value, plus a "unit" charge of ½d. for lighting, cooking or heating.

Whitby.—Loan.—The Urban District Council has received sanction to a loan of £2,000 for mains and services and £4,000 for cables, equipment, &c., in connection with the change-over.

Traction

Accrington.—Transport Merger Proposal.—A suggestion has been made for a merger of the transport undertakings of Blackburn, Accrington, Darwen, Haslingden and Rawtenstall Corporations. The project has been originated by a member of Accrington Town Council, who is of opinion that joint rather than co-operative working is called for by modern transport. It is understood that Blackburn has expressed its willingness to attend a conference to consider the matter.

Brighton.—Track Renewal.—The Tramways Committee is to commence the renewal of the track in Viaduct Road during the autumn.

Canada.—Electric Railways.—The Dominion Bureau of Statistics, in its annual report on the "Statistics of Electric Railways of Canada, 1932," shows a further decrease in revenues and traffic. Revenues amounted to $642,831,002, a decline of 11.7 per cent., whilst operating expenses were reduced from $35,367,068 to $31,516,943. The number of employés was reduced from 17,135 to 15,961. During the year 720,468,361 fare-paying passengers were carried, a decline of 10.8 per cent. Of the forty-five systems reporting, fourteen showed operating losses, whilst twenty-four showed deficits after payment of taxes, interest and other income charges. Only four paid dividends, these being the British Columbia Electric, the Cornwall Street Railway, Light and Power, the Nova Scotia Light and Power, and the Montreal Tramways. Canada had, at the end of the year, 1,313 miles of electric railway, in addition to 560 miles of second main track and 275 miles of sidings and turnouts.

Cardiff.—Trolley-buses.—Clauses in the Cardiff Corporation Bill authorising the substitution of trolley vehicles for tramways and the continuance in favour of these vehicles of the protection now given to the tramways against omnibus competition were considered on March 16th by a Select Committee of the House of Commons. Sir Henry Jackson presided. Mr. Tyldesley Jones, K.C., for the Corporation, said they wished to have authority to substitute trolley vehicles for tramways as the tracks wore out. Only where it was necessary to get a turning point to connect two routes would trolley vehicles be run anywhere except on existing tramway routes. Mr. Wm. Forbes, Corporation traffic manager, giving evidence in support of the Bill, said that the net liability on the tramway system in March, 1933, was £332,169. Loan charges amounted to £53,469. The car-mileage last year was 2,898,461, and 30,976,572 passengers were carried. With a revenue of just under £200,000, and working expenses of £148,520, there was a gross profit of £51,027. The tramway system had been successful financially except during four years, when the total loss was £33,167. Since 1904 the tramways had contributed £168,647 in relief of rates. It was most essential that they should obtain protection, since seventy-six privately owned omnibuses operated on the tramway routes. Cross-examined by Mr. Craig Henderson, K.C., on behalf of omnibus owners who had petitioned against the Bill, Mr. Forbes said the Traffic Commissioners had no control over the tramways. The Committee decided to give the Corporation the powers asked for, and approved the clauses in the Bill.

France.—Traffic Signals for Level Crossings.—It is reported that train-controlled traffic signals are to be installed at all level crossings in France. This is part of a scheme for the general overhaul of the French railways promised by M. Flandin, Minister of Public Works, after the collision at Lagny.

Halifax.—Buses Replace Trams.—The service of trams from Halifax to Queensborough is to be replaced by buses.

Traffic Signals.—The West Riding Highways Committee is to erect traffic signals costing £1,150 at Bramham Cross Roads.

The Kettering Highways Committee is to install vehicle-actuated traffic signals at Gold Street junction at an estimated cost of £525.

The Walthamstow Corporation is to install automatic traffic signals at Chingford Road junction at an estimated cost of £976.

A traffic signal at New Barnet was recently hit by a car and bent to an angle of 45 deg., but it continued to function.

The Kent Highways Committee recommends the provision of automatic traffic signals at five road junctions at a cost of £4,480, and the Maidstone Corporation is to provide traffic signals at five junctions at a cost of £1,500.

Traffic signals costing £504 are to be provided at Calverley Road by the Tunbridge Wells Corporation.

Communications

Ceylon.—Telephonic Communication with the Mainland.—The successful laying of a submarine cable across the Palk Strait between Ceylon and the mainland was completed on March 12th, and this event marks the linking up of Ceylon with the world's telephone system. The cable is thirty miles in length, and contains four continuously-loaded gutta-percha insulated cores. It was manufactured by Messrs. Siemens Brothers & Co., Ltd., at their Woolwich works.

Egypt.—Cairo.—The Egyptian State Broadcasting Service is to open a 20-kW station in Cairo next month.

Great Britain.—Radio Relay Services.—The Kensington Borough Council has refused an application by British Relay Wireless, Ltd., for permission to provide wireless relay services to Council tenants.

Permission to extend the Rochdale wireless relay service to Crompton has been refused.

The Reigate Town Council has refused to allow the establishment of a relay service involving the erection of wires across highways.

The Tonbridge Urban District Council has granted an application by Wireless Relay Services, Ltd., for permission to install a relay system.

India.—Radio for the North-West Frontier.—The arrangements for wireless broadcasting in the North-West Frontier Province of India are now practically complete. Col. Hardinge has secured from the Marconi Co. a transmitter for a year to carry out experiments in rural broadcasting. It is proposed to overcome the battery-charging difficulty by the use of nickel-iron accumulators which will be charged by connecting a motor car generator to the back wheel of a bicycle. For a nominal sum, the necessary human power would be obtainable to pedal the bicycle. Alternatively schoolboys could do a few minutes pedalling each morning as part of their gymnastic exercise.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—PERTH.—April 19th. Western Australian Government Electricity Supply. Boiler house equipment, one 25,000-kW turbo-alternator and e.h.p. and l.p. switchgear. (February 2nd.)

BRISBANE.—June 8th. City Council. Traction sub-station equipment. (A.Y. 12283.)*

Bo'ness.—March 26th. Town Council. Various works, including electric lighting, at housing scheme. W. Beattie, director of housing, Burgh Chambers.

Burntwood.—March 24th. Installation of electrical services at mental hospital. K. L. Murray, architect, County Buildings, Stafford, for bills of quantities.

Croydon.—March 27th. Electricity Department. Extension to boiler house and installation of one boiler. (March 9th.)

Dalkeith.—March 31st. Town Council. Various works, including electrical, at eighty-eight houses. Schedules from Morham and Brotchie, surveyors, 29, Hanover Street, Edinburgh; tenders to J. C. Sturrock, Town Clerk, Municipal Buildings, Dalkeith.

Dartford.—March 24th. Corporation. 250-kW rectifier equipment. (See this issue.)

Dover.—April 18th. Corporation. Cable, distribution lines, &c. (See this issue.)

Dumfries.—March 26th. County Council. Various works, including electric lighting installation, for houses at Kirkconnel. Specifications, &c., from, and offers to, J. Robson, county clerk, County Buildings.

Dundee.—Electricity Department. April 5th. A.c. meters for the year ending May 15th, 1935. (March 16th.)

Eccles.—March 24th. Two metal-clad transformer and ring main e.h.p. switchgear control units. Borough electrical engineer, 1, King Street.

Edinburgh.—March 26th. Gas Department. General stores for twelve months, from May 16th, including electrical materials, &c. Schedules, &c., from J. Jamieson, engineer and manager, 15, Calton Hill; offers to Town Clerk.

Egypt.—CAIRO.—April 7th. Public Works Ministry. Electric lamps, accumulator parts and porcelain insulators. (A.Y. 12287.)*

Epsom.—April 5th. Electricity Department. E.h.p. switchgear, metering equipment, transformers, e.h.p. cables, and mercury-arc rectifier equipment. (March 16th.)

Glasgow.—March 24th. Public Health Department. Supply of annual contracts, including electrical fittings, at hospitals. Particulars from Superintendent of Stores, Public Health Department, 23, Montrose Street; tenders to Town Clerk.

Hull.—March 27th. Telephone Committee. Automatic telephone exchange. (February 9th.)

India.—TRAVANCORE.—May 7th. Government Electricity Department. Turbines, generators, switchgear, transformers, &c., for the Pallivasol hydro-electric scheme. (February 9th.)

Inverkeithing.—April 3rd. Town Council. Various works, including electrical, at twenty houses at Spittalfield. Specifications, &c., from R. H. Motion, architect, Union Bank Chambers, Dunfermline (deposit £1 1s.); tenders to J. R. Menzies, Town Clerk.

Lochgelly (Fife).—March 24th. Town Council. Various works, including electric lighting, at 148 houses. Specifications, &c., from J. T. Scobie, architect and surveyor, 1, Douglas Street, Dunfermline (deposit £2 2s.); tenders to C. Hornal, Town Clerk, Town House, Lochgelly.

London.—FULHAM.—March 28th. Borough Council. Two 75,000-kVA and two 750-kVA transformers, an electric travelling crane and three electric and five hand-operated hoist-blocks. (March 2nd.)

GREAT WESTERN RAILWAY.—April 5th. Electrical wires, cables, lamps, &c. (March 9th.)

New Zealand.—WELLINGTON.—Posts and Telegraphs Department. April 18th. 1,000 switchboard plugs and 2,500 24-V switchboard lamps. (A.Y. 12218.)*

April 30th. Eighteen double-pole, single-throw contactors (A.Y. 12250.)*

May 7th. Thirty-seven moving-coil milliammeters and one voltmeter. (A.Y. 12272.)*

Public Works Department. May 29th. One 33-kV oil-immersed circuit-breaker. (A.Y. 12276.)*. Three single-phase potential transformers. (A.Y. 12274.)*

June 26th. Battery-charging equipment. (A.Y. 12273.)*

May 8th. 6-V secondary batteries. (A.Y. 12244.)*

May 1st. Transformer oil drying and testing apparatus. (A.Y. 12252.)*

May 22nd. Battery-charging equipment. (A.Y. 12249.)*

June 5th. 50-V storage battery and charging equipment (A.Y. 12245.)*

Northern Ireland.—BELFAST.—April 6th. Electricity Department.—Transformers and e.h.p. switchgear. (March 9th.)

CASTLEDERG.—March 23rd. Heating and electric lighting installations at Union Hospital. Clerk of Union.

Rosslynlee.—March 31st. Midlothian and Peebles District Asylum. Various articles, including electrical fittings, for six months. Forms of tender from, and offers to, C. L. Addison-Smith, clerk and treasurer, 19, Heriot Row, Edinburgh.

South Africa.—DURBAN.—April 13th. Corporation. Telephone cables. (A.Y. 12289.)* 1,000 bobbin insulators and 200 g.i. double pole brackets. (A.Y. 12286.)* Telephone materials. (A.Y. 12290.)*

PORT ELIZABETH.—April 12th. Municipality. Cables, transformers, motors and fans. (A.Y. 12285.)*

Stoke-on-Trent.—April 11th. Electrical Engineer's Department. Overhead transmission lines. (March 16th.)

Tranent.—March 26th. East Lothian County Council. Various works, including electric lighting and heating installation, at additions and alterations to infant school. Particulars from County Architect, Property and Works Department, Haddington; schedules from R. and A. K. Smith, surveyors, 4, Forres Street, Edinburgh; tenders to G. Cruickshank, County Clerk, County Buildings, Haddington.

Tredegar.—April 10th. U.D.C. Pole lines, underground cables and sub-stations and equipment. (See this issue.)

Uruguay.—MONTEVIDEO.—State Electricity Supply and Telephone Administration. April 2nd. 10,000 delta porcelain insulators and overhead transmission lines. (A.Y. 12227.)*

Workington.—March 28th. Borough Council. Transformers, switchgear, l.p. distribution board, underground link boxes and feeder pillars. (March 9th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Bedford.—Electricity Committee. Recommended. Cable.—Siemens Bros. & Co., Ltd.; Macintosh Cable Co., Ltd. Lamps.—Cryselco, Ltd.

Chesterfield.—Electricity Committee. Accepted. Cable (£119).—Macintosh Cable Co., Ltd.

Chichester.—West Sussex Public Assistance Committee. Accepted. Electric lighting at the Institution (£100).—T. F. Lummus.

Clacton-on-Sea.—Urban Council. Accepted. Switchgear for the bulk supply from the Central Board (£1,220).—A. Reyrolle & Co., Ltd.

Darlington.—Town Council. Accepted. Sub-station switchgear.—Switchgear & Cowans, Ltd.

Dartford.—Electricity Committee. Recommended. Switchgear (£6,144).—A. Reyrolle & Co., Ltd.

Fort William.—Town Council. Accepted. Electrical work at twenty-eight houses.—J. Fisher.

Glasgow.—Transport Committee. Accepted. Subway electrification: Signalling lamps.—British Power Railway Signal Co., Ltd.; air brake equipments.—Westinghouse Brake and Saxby Signal Co., Ltd.

Government Contracts.—The following contracts were placed by the various Government departments during February:—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).

Motor-generator alternators.—Small Electric Motors.

Electric cable.—Hackbridge Cable Co.; Siemens Electric Lamps.

Overhead electric travelling cranes.—Sir William Arrol.

Electrically driven fans.—Small Electric Motors.

Electric incandescent lamps.—G.E.C.

Searchlight projectors.—Laurence, Scott & Electromotors.

Electric radiators.—Ediswan.

Radio frequency generators, insulators, receivers, &c.—Marconi's.

Spare parts for searchlights, &c.—Chadburn's (Ship) Telegraph Co.; Laurence, Scott & Electromotors; London Electric Firm.

Overhead electric travellers.—Sir William Arrol.

Welding reactors.—Mawdsleys.

Welding resistances.—Allen West & Co.

WAR OFFICE.

Carbons.—G.E.C.

AIR MINISTRY.

Electric light fittings.—G.E.C.

Voltage regulators.—Johnson & Phillips.

POST OFFICE.

Telephonic apparatus.—Automatic Electric Co.; Ericsson Telephones; G.E.C.; Hall Telephone Accessories (1928); Siemens Bros.; Standard Telephones.

Testing and protective apparatus.—Phœnix Telephone & Electric Works.

Wireless apparatus.—G.E.C.; Standard Telephones.

Batteries for postmen's lamps.—Ever Ready Co.

Cable.—Connollys (Blackley); G.E.C.; Hackbridge Cable Co.; Siemens Bros.; United Telephone Cables.

Loading coils.—G.E.C.; Siemens Bros.; Standard Telephones.

Telephone cords.—B.I. Cables; G.E.C.; London Electric Wire Co.; Phœnix Telephones; Siemens Bros.; Standard Telephones.

Leclanché depolarising elements.—Atlas Carbon & Battery Co.; British Insulated Cables; Fuller Accumulator Co. (1926); I.R.G.P. & Telegraph Works Co.

Reconditioning, &c., clocks for electric light boxes.—Venner Time Switches.

Rectifiers.—Edison Swan Electric Co.

Switchboard wire.—Concordia Electric Wire Co.; Standard Telephones.

Leclanché rod zincs.—Eyre Smelting Co.; Siemens Bros.

Cable, manufacture, supply, drawing-in, and jointing.—Aberdeen-Elgin (Huntley-Elgin section): United Telephone Cables.

Cable manufacture and supply (Aberdeen-Ellon).—United Telephone Cables.

Cabling, loading coils and terminations: Brighton-Worthing No. 2 cabling.—Pirelli-General.

Cable, testing and balancing and the supply, installation and jointing of loading coil cases (London-Birmingham No. 2 cable, Birmingham-Nantwich).—Pirelli-General.

Telephone exchange equipment: City (London) (Power Plant), Girton (Cambridge) (new auto-exchange), Lochgilphead (new auto-exchange).—Standard Telephones. Tandem (Holborn) auto-exchange (auto-switching equipment).—Automatic Electric Co. Prestwich (Manchester) (power plant).—Automatic Electric Co. Sub-contractors: Alton Battery Co. for batteries; Electric Construction Co. for motor generators. Plympton (Plymouth) (new auto-exchange); Central City; London Wall; Metropolitan & National (London Area) (manual equipment).—Automatic Electric Co.; Co-operative Wholesale Society; Siemens Bros. (R.A.T. Section), Handley Multi-Exchange Area (re-ring facilities); Reliance sub-tandem (London) (installation of auto-switching plant): G.E.C. Uplands (Purley) (new auto-exchange); Derwent (London) (new auto-exchange): Ericsson Telephones.

Telephonic repeater equipment.—Liverpool, Leeds: Standard Telephones. Bristol: G.E.C.

CROWN AGENTS FOR THE COLONIES.

Cells for alkaline batteries.—Batteries, Ltd.
Condensing plant.—Worthington-Simpson.
Copper wire.—R. Johnson & Nephew; Shropshire Iron Co.
Copper wire, &c.—Whitecross Co.
Electrical spares.—Crompton-Kye Lamp Sales.
Switchgear for power station.—B.T.-H.
Telephone apparatus.—G.E.C.
Telephone cables.—Standard Telephones.
Telephone switchboard and apparatus.—Siemens Bros.
X-ray equipment.—Schall & Sons.

Kettering.—Electricity Committee. Recommended. Switchgear, &c. (£395).—Ferguson, Pailin, Ltd.

London.—EALING.—Library Committee. Accepted. Wiring and fittings at Greenford Library (£299).—T. G. Field. (This was the lowest tender out of eighteen, the highest being £434.)

Motherwell.—Town Council. Accepted. Electrical work at 312 houses at Greenhead (£2,292).—D. Henderson.

Pembrokeshire.—Hospital Committee. Accepted. Electric lighting installation at mental institution (£1,685).—Colston Electrical Co., Ltd.

Rawtenstall.—Electricity Committee. Accepted. Metering equipment.—Ferranti, Ltd.

Renfrew.—Town Council. Accepted. Electrical work at sixty-eight houses (£299).—Colquhoun & McArthur.

Standish.—Urban Council. Accepted. Wiring fifty-seven houses for electricity (£345).—Corlett Electrical Engineering Co., Ltd.

Stoke-on-Trent.—Assistance Committee. Accepted. 75-kW generating set at Turnhurst Road Institution (£1,056).—Couzens & Akers, Ltd.

Electricity Committee. Accepted. Mains and cables for twelve months.—Callender's Cable & Construction Co., Ltd. Overhead house-to-house services for twelve months.—E. Holloway.

Tottenham.—New electrical installation for the Town Hall and Central Baths to the specification of Mr. F. C. Raphael.—We have received a list of the seventeen tenders submitted. The highest was by Messrs. Elliston, Evans & Jackson, Ltd., at £2,797, and the lowest (which was accepted) was by the Springvale Electrical Co., London, W.14, at £1,648.

Forthcoming Events

Birmingham Electric Club.—Friday, March 23rd. Grand Hotel, Birmingham. 7 p.m. "The Industry and its Advancement—Five Points of View."

Junior Institution of Engineers.—Friday, March 23rd. Institution, London. 7.30 p.m. "High Voltage Alternators and some Notes on the Properties of Insulating Materials." Mr. J. Rosen.

Institution of Electrical Engineers.—Monday, March 26th. Institution, London. 7 p.m. Discussion on "Modern Developments in Electric Cookers." Opened by Miss D. Vaughan. (*London Students' Section*).—Friday, March 23rd. Institution, London. 6.15 p.m. Address by Mr. P. V. Hunter. Saturday, March 24th. 2.30 p.m. Visit to the National Physical Laboratory, Teddington. (*North-Eastern Students' Section*).—Friday, March 23rd. Armstrong College, Newcastle-on-Tyne. 7.15 p.m. Joint meeting with the N.E.C. Graduates. "The Science of Television." Mr. R. V. Powditch. (*North Midland Students' Section*). Saturday, March 24th. Visit to works of the Yorkshire Coking & Chemical Co., Castleford. Tuesday, March 27th. Hotel Metropole, Leeds. 7.15 p.m. Annual general meeting. (*North-Eastern Centre*).—Monday, March 26th. Armstrong College, Newcastle-on-Tyne. 7 p.m. "The Measurement of Noise, with special reference to Engineering Noise Problems." Messrs. B. A. G. Churcher, A. J. King, and H. Davies. (*North-Western Students' Section*).—Tuesday, March 27th. Engineers' Club, Manchester. 7.15 p.m. "Development of a Continuous Plating Plant." Mr. J. H. Snelson.

Electrodepositors' Technical Society.—Wednesday, March 28th. Northampton Polytechnic Institute, London. 8.15 p.m. Second William James Memorial Lecture. Prof. R. S. Hutton.

Makers' Names Wanted

Electric tooth brush.
TOLEDO furnaces.
Acid proof "fritts" for cast-iron vitreous enamels.

Appointments Vacant

Research engineer, electrical engineer, and wiring supervisor for the Engineering Branch of the British Broadcasting Corporation.

Chief accounting officer for the Derby Electricity Department.

Station superintendent for Maidenhead Electricity Department. (See our classified advertisements.)

Notes

E.I.B.A. (South Coast Section)

The recently formed South Coast Branch Centre of the Electrical Industries Benevolent Association held a dance at the Grand Hotel, Brighton, on March 16th. Various manufacturers gave a number of electrical appliances as prizes, and in addition to several visitors from London those present included Lord Meston, president of the Association, Mr. Allen West (chairman of the branch committee), Capt. J. T. Keeping (national secretary), Ald. and Mrs. N. J. Galliers, Mr. W. N. C. Clinch (borough electrical engineer, Brighton) and Mrs. Clinch, Mr. F. Swarbrick (Hove borough electrical engineer) and Mrs. Swarbrick, Mr. R. N. Torpy, of Tunbridge Wells, Mr. H. J. Miles, and Mr. G. Porter, of Worthing. The success of the function was largely due to Mr. B. S. H. Warde, the hon. organising secretary, who was responsible for the arrangements.

The Death of a Buzzard

In our issue of March 9th, a correspondent referred to the loss of bird-life due to contact with overhead conductors. The photograph which we reproduce herewith, taken by Mr. G. J. Hollyer, borough electrical engineer and manager, Torquay, has been sent to us by the Pirelli-General Cable Works, Ltd. It shows a buzzard measuring 42 in. between wing tips, which was killed by flying into a 11-kV three-phase overhead line at Ughborough, between Modbury and South Brent. The

A buzzard killed at Ughborough

service of the lines which form part of an extensive rural distribution system, extending over an area of some 425 square miles, was not interrupted and only a slight voltage kick was noticeable. The bird was killed but there was no trace of burning. On several occasions, trouble has been experienced on lines in this area from a like cause and the number of large birds that abound is remarkable. The lines and their accessories are designed as far as possible to reduce interference of this nature to a minimum.

Birmingham Electrical Power Engineers

The annual dinner of the Midland Division, Birmingham Section, of the Electrical Power Engineers' Association took place at the Midland Hotel, Birmingham, on March 16th. In proposing the toast, "The Association," Mr. S. T. Allen (manager for the Central England area of the Central Electricity Board) warmly acknowledged the co-operative spirit shown by the various electricity undertakings and their staffs, and added that a good relationship existed between the Central Board and the owners and staffs of the many factories and other premises in which changes of frequency had been effected. The E.P.E.A. was recognised as a body which could render valuable assistance in the general advance of efficient means of producing and distributing electricity. The toast was acknowledged by Mr. E. Jones (vice-president of the Association), who pointed out that they stood for a square deal so far as the employers were concerned, and were doing their best, by training apprentices, to spread technical knowledge among junior members of the profession. The toast of "The Guests" was submitted by Mr. R. H. Rawll (chairman of the Section), who paid tribute to the valuable work done on behalf of the industry by Alderman Sir Percival Bower (chairman of the Birmingham Electric Supply Committee). Mr. H. C. Hooper (hon. secretary, South Midland Centre, I.E.E.) also spoke. A dance followed the dinner.

Belfast Engineers' Dinner

Over 200 members and their guests attended the annual dinner of the Belfast Association of Engineers on March 10th. Mr. R. Cairns, president, was in the chair, and in reply to Mr. A. Brown, who proposed "Prosperity to Northern Ireland," the Rt. Hon. J. Milne Barbour, Minister of Commerce, referred to various engineering, harbour, and drainage schemes, representing an outlay of nearly £4.5 millions towards which the Government had contributed nearly a million. Other speakers were Mr. D. B. Marr; Mr. W. E. McConnell, chief engineering surveyor to the Board of Trade; Mr. J. M'C. Barry, hon. treasurer; Mr. W. J. Lovett, deputy chairman of Workman, Clark (1928), Ltd.; Alderman D. Hall Christie, M.P.; and Brig.-Gen. Magnus Mowat. The dinner was followed by a concert and dance.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Lord Rayleigh was elected president of the Physical Society at the annual meeting held on March 16th. The other officers are as follows: Vice-president, Dr. D. Owen; secretaries, Dr. A. Ferguson (papers) and Dr. E. Griffiths (business); foreign secretary, Prof. O. W. Richardson; treasurer, Mr. R. S. Whipple; librarian, Dr. J. H. Brinkworth; new members of the Council, Mr. H. H. Emsley and Prof. H. R. Robinson.

Photographs of **Mr.** L. L. Horrell, City Electrical Engineer of Pretoria, South Africa, and Mr. A. E. Nicholson, the Town Clerk, who are at present in this country in connection with important electrical and industrial operations, appeared on page 370 of our last issue. Another visitor here from the same city is **Mr. J. T. Becklake,** A.M.I.E.E., who is superintendent of the operative department of the Royal Mint, Pretoria. Mr. Becklake is interested in the latest developments in rolling plant and melting and annealing furnaces for non-ferrous metals and has visited a number of works in this connection recently. He intends to sail for South Africa early in April.

Mr. J. T. Becklake

Herr Phillip Kessler, who has been chairman of the Bergmanns Elektrizitäts Werke A.-G., of Berlin, since 1931, has been appointed "leader" under the reorganisation scheme for German industry announced last week by the Minister of Economic Affairs.

Mr. W. Burton, M.Eng., has been nominated by the Committee of the South Midland Centre of the Institution of Electrical Engineers for the chairmanship during next session.

Major A. D. Pearce

Major A. D. Pearce, who has been representative in the Birmingham and Midlands area of B.E.N. Patents, Ltd., since July, 1932, has been invited by the Amateur Fencing Association to represent England against the United States with foil and sabre, of which he is an accomplished exponent. He won the amateur foils championship in 1928, and represented England at the Olympic Games which were held in Amsterdam.

Mr. R. H. Rawll, A.M.I.E.E., frequency-change engineer in the Birmingham Corporation Electric Supply Department, and chairman of the Birmingham and District Section of the Electrical Power Engineers' Association, has been re-elected a member of the North-West Midlands Joint Electricity Authority, representing the various employés' organisations.

Mr. A. J. Dalton has been appointed by the Dorchester Town Council as temporary technical assistant to the borough electrical engineer.

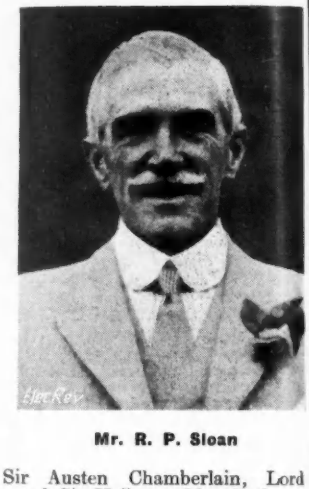
Mr. G. V. Bewoor, C.I.E., Postmaster-General at Bombay, has been appointed to succeed the late Sir Thomas Ryan as Director-General of Posts and Telegraphs in India. Mr. Bewoor was educated at Bombay and Sidney Sussex College, Cambridge, and entered the Indian Civil Service by examination in 1911. In 1922 he became Postmaster-General of Bihar and Orissa; a few months later he was appointed Deputy Commissioner, and two years after became Deputy Director-General of Posts and Telegraphs.

Miss Rachael Mary Parsons, daughter of the late Sir Charles and Lady Parsons, has been elected a member of the North-East Coast Institution of Engineers and Shipbuilders. Her mother, the late Lady Parsons, had the distinction of being the only woman honorary member of the Institution. During the War Miss Parsons was a director of Messrs. C. A. Parsons & Co., Ltd., and she also held an appointment in the Ministry of Munitions.

Mr. D. H. Robinson has been appointed by the Government of the Punjab as executive engineer in the Electricity Branch of the Punjab Public Works Department.

Mr. Bertram Kelly, borough electrical engineer, Douglas (Isle of Man), has been granted an honorarium by the Corporation in respect of additional work in connection with the recent extensions to the Pulrose power station from which a bulk supply is given to the Isle of Man Electricity Board for distribution outside the Corporation's area of supply.

Mr. R. P. Sloan intimated at last Tuesday's meeting of the North-Eastern Electric Supply Co., Ltd., that he intended to resign the managing directorship of the company in nine months' time, but that he would continue as a member of the board. It was also announced this week that Mr. Sloan was joining the Edmundson group as a member of the boards of the Greater London & Counties Trust, Ltd., Edmundson's Electricity Corporation, Ltd., and other companies. The Greater London & Counties Trust controls, *inter alia*, the Shropshire, Worcestershire & Staffordshire Electric Power Co., the Urban Electric Supply Co., and the Bedfordshire, Cambridgeshire & Huntingdonshire Electricity Co. The directors of the trust are: General Wade Hampton Hayes, Sir Austen Chamberlain, Lord Meston, Sir Philip Dawson, and Sir Holberry Mensforth.



Mr. R. P. Sloan

Mr. H. D. Taylor has been awarded the eleventh Duddell Medal by the Council of the Physical Society for his work in the development of optical instruments.

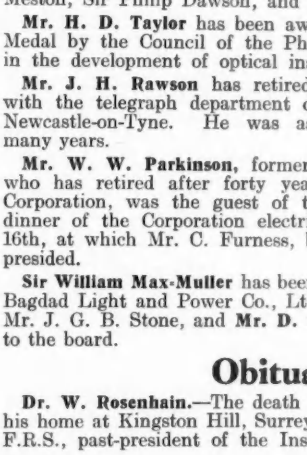
Mr. J. H. Rawson has retired after forty years' service with the telegraph department of the General Post Office, Newcastle-on-Tyne. He was assistant superintendent for many years.

Mr. W. W. Parkinson, former electricity superintendent, who has retired after forty years' service with Blackpool Corporation, was the guest of the evening at the annual dinner of the Corporation electricity works staff on March 16th, at which Mr. C. Furness, borough electrical engineer, presided.

Sir William Max-Muller has been appointed chairman of the Bagdad Light and Power Co., Ltd., in succession to the late Mr. J. G. B. Stone, and **Mr. D. S. Warren** has been elected to the board.

Obituary

Dr. W. Rosenhain.—The death occurred on March 17th, at his home at Kingston Hill, Surrey, of Dr. Walter Rosenhain, F.R.S., past-president of the Institute of Metals. In 1901 he was appointed scientific adviser to Messrs. Chance Bros., glass manufacturers and lighthouse engineers, with whom he remained until 1908, when he was appointed first superintendent of the Department of Metallurgy and Metallurgical Chemistry at the National Physical Laboratory, a position which he held for twenty-three years. He was elected F.R.S. in 1913, and was president of the Institute of Metals from 1923 to 1930. He was also a member of numerous other scientific and technical societies. He resigned his position at the N.P.L. in 1931 in order to take up private practice in London as a consulting metallurgist. In that capacity he was connected



Mr. Gustaf Stjernberg, sales manager of the Swedish General Electric Co., whose death was reported last week

with the British Aluminium Co., Ltd., the Broughton Copper Co., Ltd., and Messrs. J. Stone & Co., Ltd.

Ald. Sir Harry Hatt, prominent in the public affairs of Bath, and well known in electrical circles as chairman of the Electricity Committee, died on Monday last at the age of seventy-five. He was elected an alderman of the city in 1911, and was mayor in 1915-16.

Monsieur J. L. P. C. Chappuis.—The death occurred recently, at the age of seventy-nine years, of M. James L. P. C. Chappuis, the chief of the Physical Research Laboratory of the Société du Gaz de Paris. In 1881 he was appointed to the Chair of General Physics at the Ecole des Arts et Manufacturers, Paris, a position which he held until 1922. M. Chappuis took an early part in the development of hydro-electric stations in France, and in 1902 formed a company to operate a plant in the Auvergne for the supply of electricity to the towns of Thiers and Vichy. He was a member of the Committee of the Société Française des Electriciens.

Mr. E. L. Pease, of Darlington, has died at his home at the age of seventy-three. He was prominently identified with power, iron and coal enterprises, and was a director of a number of companies, including Waste Heat and Gas Electrical Generating Stations, Ltd., of which he was chairman.

Will.—The late **Mr. Cromwell Oliver Varley** left £45,105 (net personalty £40,975).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Novo Radio-Electric, Ltd.—Private company. Registered March 12th. Capital, £1,000 in £1 shares. Objects: To carry on the business of designers and manufacturers of and dealers in radio and television transmitting and receiving apparatus, &c. The first directors are: W. Black, junr., "Rathdhu," 21, Manor Road, Longbenton; and Lt.-Comdr. Harry Thorman, R.N. (retd.), Rose Bank, Corbridge.

Belton & Reid, Ltd.—Private company. Registered March 17th. Capital, £1,000 in £1 shares. Objects: To acquire the business of electrical and wireless engineers and contractors carried on by Chas. L. Belton and Archibald P. Reid, at 53, Derby Road, Long Eaton, as "Belton & Reid." The first directors are: C. L. Belton, 34, Breedon Street, Long Eaton, near Nottingham, and A. P. Reid, 54, Breedon Street, Long Eaton. Solicitors: S. J. B. Thomas & Co., Long Eaton.

Bylock Electric, Ltd.—Private company. Registered March 15th. Capital, £5,000 in £1 shares. Objects: To carry on business as manufacturers of and dealers in dynamos, motors, armatures, batteries, wireless and electrical plant, &c. The permanent directors are: E. Flurry, 77, Fordsmead Road, Tottenham, N.17, and P. Doering, Bylock Hall, 109, South Street, Ponders End, Middlesex. Registered office: Bylock Hall, South Street, Ponders End.

Hamsey Green Service, Ltd.—Private company. Registered March 16th. Capital, £100 in £1 shares. Objects: To carry on the business of consulting wireless experts, designers, manufacturers, and repairers of and dealers in radio apparatus, &c. The permanent directors are: A. H. Greasley (chairman) and Mrs. Ethel G. Greasley, both of Bletchingley Garage, Bletchingley, Surrey. Solicitors: Grece & Pringle, Redhill.

East Yorkshire Relay Co., Ltd.—Private company. Registered March 16th. Capital, £500 in £1 shares. Objects: To construct, establish, and maintain wireless signal stations, &c. The permanent directors are: L. S. Kemp, "Coulsdon," Cliff Road, Hornsea, and M. A. Fullam, Newbigin, Hornsea. Solicitors: C. E. Gresham & Son, Hull.

Thompsons (Victoria), Ltd.—Private company. Registered March 16th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electrical and wireless apparatus, musical instruments, &c. The permanent directors are: T. W. Delasaux, 9, Phoebeth Road, Brockley, S.E.4, and T. H. Delasaux, 36, Blissett Street, Greenwich, S.E.10. Registered office: 17, Strutton Ground, Westminster, S.W.1.

Electrical Fixed Trust, Ltd.—Private company. Registered March 17th. Nominal capital, £100 in £1 shares. Objects: To constitute any trust with a view to the issue of any special stocks or securities, and to carry on the business of an investment trust company, &c. The subscribers are: Owen J. Humbert (secretary), Warren Wood, Ashtead, Surrey, and G. J. Stringer, The Old Drive, Welwyn Garden City, Herts. Solicitors: Taylor & Humbert, 4, Field Court, Gray's Inn, W.C.1.

Gradley Electrical Co., Ltd.—Private company. Registered March 12th. Capital, £2,000 in £1 shares. Objects: To carry on the business of wholesalers and manufacturers and repairers of, agents for, and dealers in electrical and mechanical equipment, apparatus and supplies, &c. The directors are: M. C. Laurence, 44, Lyndhurst Gardens, Finchley, N.3; and H. E. Davis, A.I.E.E., 108, Dartmouth Road, Willesden Green, N.W.2. Registered office: 1, Castle Street, Finsbury Square, E.C.2.

Neon Signs (Preston), Ltd.—Private company. Registered March 12th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electric and other signs for advertising and display, &c. The permanent directors are: T. Parkinson, 25, Roebuck Street, Blackburn; and S. Eteson, Brantwood, Cromwell Road, Preston.

Returns of Electrical Companies

Electrical Distribution of Yorkshire, Ltd.—The nominal capital has been increased by the addition of £300,000 beyond the registered capital of £1,900,000. The additional capital is divided into 300,000 6 per cent. cumulative preference shares of £1.

New Era Installation Trust, Ltd.—Issue on December 28th, 1933, of £1,000 debentures, part of a series already registered. (Notice filed March 12th, 1934.)

Radio Rentals, Ltd.—Charge on moneys, &c., due or to become due under certain hiring agreements, dated March 6th, 1934, to secure such sums as shall be advanced by the chargees (Trade Promotion Trust, Ltd., Bouverie House, Fleet Street, E.C.4), to the company not exceeding in the aggregate £1,817 18s.

Harts Wireless Supplies, Ltd.—S. G. Crimes, 150, Southampton Row, W.C., was appointed receiver and manager on March 12th, 1934, under powers contained in debentures dated June 19th, 1933.

Etherwave, Ltd.—Capital, £1,000 in £1 shares. Return dated December 6th, 1933. All shares taken up. £1,000 paid. Mortgages and charges, £800.

England-Richards Fluid-Free Cell Co., Ltd.—Capital, £5,000 in 4,000 10 per cent. cumulative preference and 1,000 ordinary shares of £1. Return dated October 23rd, 1933. 1,429 preference and 1,000 ordinary shares taken up. £1,730 paid on 1,429 preference and 301 ordinary shares, £699 considered as paid on 699 ordinary shares. Mortgages and charges, £1,300.

Crosland, Ltd.—Capital, £2,000 in £1 shares. Return dated November 4th, 1933. 1,002 shares taken up. £1,002 paid. Mortgages and charges, nil.

Sun Radio, Ltd.—The nominal capital has been increased by the addition of £500 in £1 ordinary shares beyond the registered capital of £500.

South Wales Rediffusion Services, Ltd.—The nominal capital has been increased by the addition of £49,000 beyond the registered capital of £1,000. The additional capital is divided into 30,000 redeemable preference shares of £1 and 76,000 ordinary shares of 5s. The 1,000 shares of £1 each in the original capital have each been sub-divided into 4 shares of 5s. (This increase is for the purpose *(inter alia)* of acquiring the undertaking of the Newport Rediffusion Service, Ltd., in voluntary liquidation.)

Central Sussex Electricity, Ltd.—Satisfaction in full on February 8th, 1934, of charge dated January 18th, 1934, and registered January 28th, 1924. (According to the register of mortgages, the charge registered January 28th, 1924, originally secured all moneys due to bank.)

W. J. Burroughes & Sons, Ltd.—Debenture dated March 7th, 1934, to secure £490, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Frank M. Burroughes, 7, Kent Avenue, Ealing, W.

Fagin's, Ltd.—R. M. Fowler, 10, Station Parade, S.W.12, was appointed receiver on February 28th, 1934, under powers contained in debentures dated June 6th and 13th, 1933.

General Accessories Co., Ltd.—Satisfaction to the extent of £3,200 on June 30th, 1933, of trust deed dated January 4th, 1933, and registered January 17th, 1933, securing £16,000 debenture stock.

Liverpool H. P. and Wholesale Co., Ltd.—Particulars filed of £1,000 debentures authorised February 16th, 1934, charged on the company's undertaking and property, present and future, including unpaid capital, the amount of the present issue being £200.

Jimmy Wilde and Fred Price, Ltd.—Particulars filed of debentures not exceeding £500 authorised January 22nd, 1934, charged on the company's property, including uncalled capital, the amount of the present issue being £350.

New Companies.

City Notes

The North-Eastern Electric Supply Co., Ltd.—Speaking at the annual meeting on Tuesday last, Mr. R. P. Sloan, C.B.E. (chairman) said that the increase in connections to the company's system in 1933—44,252 h.p.—constituted a record. Of the increase 60 per cent. represented additional business from lighting and domestic consumers, the number of new connections of this class being 21,309. Over 13,000 domestic appliances were installed during the year and the majority of these were purchased through the company's own showrooms and were of the larger current-consuming class. The progress which they were making in country districts showed how rural dwellers appreciated electrical service. The special difficulties met with in this type of supply were being overcome and he looked forward to further developments in this field. During 1933 they took over the area of the Hexham & District Electric Supply Co., and that company was being wound up. They were now feeling the advantages of their amalgamation Act. Mr. Sloan then reviewed the financial results which were given in our last issue (page 398). He went on to say that the company's prospects, which depended so largely upon the prosperity of the district, as a whole, were considerably brighter than they had been for some time past. The general improvement among the collieries which took place last year was likely to be maintained; the iron and steel industries were in a more favourable position than they were a year ago; shipbuilding showed a distinct improvement; and among the more general type of

industries the outlook was also brighter. The orders in hand for additional supplies at the commencement of the current year exceeded 18,000 h.p. The continued expansion of the domestic supply business was being maintained and the new connections for the first nine weeks of the year had averaged over 300 per week. Good progress was being made with the change of frequency and they anticipated that the complete change would be effected in 1937. In addition to the starting up of the new 50-cycle station at Dunston they had changed over more than 110,000 h.p. of turbine plant at other stations and orders had been placed for a further 51,500 h.p. of plant. Over 300,000 h.p. of motors on consumers' premises had already been changed and much other incidental work on cables, substations, &c., had been completed. In addition to this they also had in hand the change of system from d.c. to a.c. in Newcastle city itself.

The Isle of Thanet Electric Supply Co., Ltd.—Presiding at the annual meeting on March 14th, Mr. A. R. Hoare said that since the last meeting they had entered into a provisional arrangement with the Margate Corporation in connection with the electricity undertaking, as a result of which they had introduced, as from January 1st, two-part tariffs both for domestic and business premises, and a considerable number of consumers had already taken advantage of the new charges. The Margate Corporation had undertaken, subject to a like agreement by the other local authorities in whose areas the company gave a supply, to enter into negotiations for an extension of the company's tenure.

The County of London Electric Supply Co., Ltd., held its annual meeting on March 20th, Sir Bernard E. Greenwell, Bt. (chairman), presiding. In presenting the report and accounts (ELECTRICAL REVIEW, March 16th, p. 397), the chairman said that the sales of electricity totalled 693,374,135 kWh, an increase of 14.7 per cent. over 1932. A substantial increase in the number of new consumers was to be recorded. The completion of the new section of the Barking power station was a big step forward. The two new 75,000-kW sets were now running, and the station had a capacity of 390,000 kW, and had become not only the largest station in this country but the largest in Europe on one site. There was actually a reduction in the total works cost per kWh sent out as against previous years, although the running-in and tuning-up of the new plant caused a slight increase in the consumption of coal per kWh sent out. As from January 1st last Barking and Wandsworth stations began operations under the provisions of the Electricity (Supply) Act, 1926. Barking power station formed the main source of generation for the South-East England and the East England schemes of the Central Electricity Board. During the year the company absorbed further territories. They comprised a small area near Ilford, Saffron Walden and district, and the Caterham and Waldingham undertakings. Negotiations were in progress for the acquisition of the Chelmsford undertaking. The current year had started well, and the sales had already shown an increase of nearly 30 per cent. After the first quarter of this year reductions in rates were to take effect in Woodford, Romford, Mitcham, Coulsdon, and Purley, Success was being met with in the new market of public street lighting. London boroughs as well as numerous other local authorities were turning to the company for assistance in better and more economical means of street lighting by electricity. Associated companies continued to show good results. A large area, comprising the Weald Co. in Kent and Sussex, had this year entered the dividend earning stage, and reductions in rates for supply there had been announced. The report and accounts were adopted, and a resolution was passed enabling the board to issue existing authorised preference shares on terms more consistent with the present-day market values than were attached to those shares when authorised in 1929.

The Lancashire Electric Light & Power Co., Ltd., reports that the trading profits of the subsidiary companies (the Lancashire Electric Power Co. and the Ormskirk Electric Supply Co., Ltd.) for 1933, including interest receivable, was £346,357, as compared with £299,296 in the preceding year; to this is added £4,619 brought in, making £350,976. After providing for income tax, depreciation, &c., the balance paid over to the Electric Light & Power Co., plus management fees and sundry receipts, amounts to £245,667. The company's net balance is £187,397, as compared with £138,045 in 1932, and with £8,360 brought in there is a total of £195,757 available. As announced in our last issue, the final dividend is 5 per cent., making 7½ per cent. for the year, against 7 per cent., and £8,978 is carried forward. The report states that the subsidiary companies' business continues to expand at a satisfactory rate, and during the year considerable extensions were made to the mains and distributors of these companies. The scheme of the Central Electricity Board for North-West England and North Wales came into operation on January 1st last, and the generating stations of the Parliamentary company are now being operated thereunder. In June, 1933, the balance of 59,975 6 per cent. cumulative first preference shares of £1 each, was issued, bringing the total amount of such shares up to the authorised amount of £571,415. The Lancashire Electric Power Co. generated or purchased 326,333,445 kWh in 1933, as against 287,305,622 kWh in 1932, the maximum load increasing from 126,190 to 142,500 h.p. and the h.p. connected from 165,280 to 179,000. Receipts were £736,100 (against £666,395) and the profit on trading £343,900 (against £297,077).

The Shanghai Electric Construction Co., Ltd., held its annual meeting on March 14th. Mr. J. S. Haskell (chairman), who presided, said that operations were continuous during 1933, whereas in 1932 they were interrupted to a considerable extent by the Sino-Japanese conflict. The operating profit for 1933 was $2,056,603, as compared with $1,796,155 in 1932 and $2,979,578 in 1931. The main reasons for the decrease as compared with 1931 were the general trade depression and consequent unemployment, the non-recovery of the large area in Chapei from the disturbances of 1932, the fall in the average value of copper coins and the increase in competition by the China General Omnibus Co. The loss arising out of the depreciation of copper had been counteracted to some extent by a more favourable rate of exchange for the silver currency.

At an extraordinary meeting which followed resolutions were passed for the capitalisation of £60,000 of undivided profits of the company and its distribution as a bonus to the shareholders, the alteration of the articles of association to provide for the transfer of the control of the company to Shanghai, and the provision of compensation to directors for loss of office.

The Clyde Valley Electrical Power Co. held its annual meeting on March 20th, when Mr. C. Ker (chairman), who presided, said that when they met last year there were signs that trade in the area which they served was getting better, and their barometer rose steadily during 1933. The immediate prospects were favourable, both in sales of power and in the domestic branch. Of the increase of £44,000 in receipts from the sale of electricity, £37,000 was for increased power sales and £7,000 for increased lighting and domestic consumption. For power they sold 13.37 per cent. more kWh and increased their revenue by 7.10 per cent. over the preceding year. New contracts signed during the year showed an increase of 28,000 h.p. against an increase of 20,000 h.p. during 1932. The number of consumers increased during the year by 14,788, and 70,000 customers were now connected to their system and that of the Strathclyde Co. The principal reason for promotion of the Provisional Order was the rapid expansion of their subsidiary the Strathclyde Electric Supply Co., Ltd. They were taking the opportunity at the same time of applying for power to increase the capital when necessary, and to extend their area of supply to coincide with the area of a Special Order which was being promoted by the Lanarkshire County Council and which would be operated by the company under agreement with the Council. A small addition had also been applied for in Dumbartonshire. An agreement had been reached with the Coatbridge Town Council whereby the company would operate the electricity undertaking in that burgh for a period of forty years. Referring to the Glasgow Corporation Provisional Order an agreement was come to with the Corporation whereby the company withdrew from that area. By exercising its option the Corporation had taken over the supply of 3,000 consumers.

The Morgan Crucible Co., Ltd., is holding an extraordinary meeting at which resolutions will be submitted for the formation of a new company with a capital of £4,237,000, divided into 1,000,000 5½ per cent. cumulative first preference shares; 1,079,000 5 per cent. cumulative second preference shares (the new company reserving the right to issue at a later date additional second preference shares to make the total up to 1,500,000); 2,000,000 ordinary shares; and 158,000 "B" ordinary shares, all of £1 each. The principal object of the new company will be the acquisition of the undertaking and assets of the existing company (with the exception of assets consisting of cash and investments to the value of £1,079,000) in consideration of an allotment by the new company of its first preference and ordinary shares credited as fully paid.

John Shaw & Sons (Wolverhampton), Ltd., report a loss for 1933 of £57,420, making the total at deficiency account £255,608. A sum of £40,650 is transferred from capital reserve, leaving a total debit of £214,958. It is proposed to carry this forward pending a reduction of capital at a later date. Drastic reorganisation is now proceeding covering control, new methods, liquidation of certain enterprises, and reduction of stocks, in the hope that the main department of the Wolverhampton business may be preserved. Reorganisation of the board is under consideration and Mr. J. H. Barker has been elected chairman. Meeting: March 27th.

The Midland Electric Corporation for Power Distribution, Ltd., reports a profit for 1933 of £86,929, from which is deducted income tax, £24,957, and the preference dividend £10,500. It is proposed to pay a final dividend of 5 per cent. on the ordinary shares, maintaining the distribution for the year at 8 per cent., and to carry forward £9,472. A reduction of 10 per cent. in the standard tariff was put into operation as from January 1st, 1933. The industrial load began to increase in May, and each succeeding month showed a steady improvement. Over 3,000 new consumers were connected during the year, and this rate of progress is being maintained. Meeting: March 27th.

The City of London Electric Lighting Co., Ltd., held its annual meeting on March 21st, when Mr. J. B. Braithwaite (chairman), who presided, said that the progress during the past year had been comparatively slight, there having been an increased output of only 2,000,000 kWh, but in view of the trade depression and other handicaps the increase was fairly satisfactory. The capital expenditure during the year had been about £90,000, of which £70,000 had been spent in preparing for connection with the Central Electricity Board's system. They had made a small reduction to consumers during the year, and taking the entire output they had brought the average price down from 1.83d. to 1.782d. per kWh.

The Anglo-Portuguese Telephone Co., Ltd., reports a net profit of £70,618 for 1933, as against £70,675 in 1932, which with £40,050 brought in makes £110,668. The ordinary and "A" shares again receive 8 per cent. and £33,702 is carried forward. During the year the outstanding 7 per cent. first mortgage debenture stock to the nominal value of £50,405 was paid off in cash, and the 5½ per cent. first debenture stock now constitutes the sole charge upon the undertaking and assets. On January 1st last 123,908 ordinary £1 shares were offered to, and taken up by, shareholders on a *pro rata* basis at 23s. per share. At the annual meeting on March 26th a resolution is to be submitted authorising the creation of 250,000 additional shares of £1 each.

The Telephone & General Trust, Ltd., held its annual meeting on March 15th, when Sir Alexander Roger (chairman), in the course of his speech, said that the short-term borrowing and lending policy which they conducted had been of great benefit and convenience both to the telephone manufacturing and operating companies with which they were associated and to the Trust. Advances against security were £282,452. This sum represented the balance at the end of 1933 of the credit made available in goods and cash to the State undertaking of Polish posts, telegraphs and telephones, in accordance with the terms of the contracts entered into by the Trust in 1931 with the aid of the Exports Credit Department of the Board of Trade. The business was progressing satisfactorily. A valuation of their quoted investments made at the end of the year

showed that their value in the aggregate was in excess of the figure shown in the balance sheet, while unquoted investments were conservatively valued. The telephone operating companies in which they were interested continued to make progress, although the deepening of world depression had a retarding effect in 1933 in certain directions.

Waygood-Otis, Ltd.—Presiding at the annual meeting held on March 15th, Mr. D. W. R. Green (chairman) said that they had been able to maintain their profits by securing a substantial volume of work. Their service business had shown every sign of continued progress, their subsidiary companies continued to earn profits, and in their export markets generally they had been able to maintain contact with customers. Important lift contracts secured during the year included those for the new offices of the L.M.S. Railway at Euston, for Brook House, Park Lane, for the L.N.E.R. and L.M.S. hotel services, and for the modernisation of the lifts which they installed over thirty years ago at Ascot racecourse. The new Cumberland Hotel was also equipped with their modern type of signal-control passenger lifts. They had been awarded the contract for the lifts for the new building of the Royal Institute of British Architects, and they had completed during the year several escalator installations for stores, both large and small, throughout the British Isles and the Dominions.

The Bournemouth and Poole Electricity Supply Co., Ltd., reports a net revenue for 1933 of £155,992, as compared with £160,326 in the preceding year; to this is added £6,486 brought in, making £162,478. After deducting debenture interest and transferring £5,000 to change-over expenditure suspense account, and £43,000 to reserve for depreciation, renewals, &c., it is proposed to pay a final ordinary dividend of 9 per cent., maintaining the distribution for the year at 15 per cent., and to carry forward £16,225. The sales of electricity increased from 25,693,546 to 29,123,385 kWh. The company has acquired a controlling interest in the Swanage Gas & Electricity Co. by an exchange of shares. As a result the transmission system has been extended into the Swanage area and the local station has been closed down. Reductions in charges have been made in Kinson and Broadstone and in the area covered by the Wimborne and District Electricity (Extension) Special Order, 1931. Meeting: March 27th.

The Constantinople Telephone Co., Ltd., reports a net profit for the year ended December 31st last of £T.5,013 (against £T.1,475 in 1932). This is added to £T.9,125 brought in, making £T.14,138, which is carried forward. As from January 1st, 1934, a reduction in the tariffs was effected. The reduced tariffs will be insufficient to meet the charges as stipulated in the company's agreements and application is being made to the Government to increase the tariffs. On the basis of the tariffs then in operation, the profit balance for the past year represents 1½ per cent. on the capital only, but the Government demands that the reductions should be applied retrospectively as from July, 1932. This would involve a loss to the company of approximately 200,000 Turkish current liras and would form a serious addition to the company's liabilities. The matter has been referred to the Council of State. Meeting: Istanbul, March 31st.

Baird Television, Ltd., reports that the net expenditure on profit and loss account was £27,580. This has been transferred to general development account, the total of which, including interests in subsidiary and associated companies, is now £314,664. Patents, trade marks, &c., stand at £518,006. With regard to the issue last year of 200,000 "A" ordinary 5s. shares, the report states that 45,426 shares were subscribed by shareholders and paid up in full. The balance of 154,574 shares has been allotted to the underwriters. At the meeting on March 20th, when Sir Harry Greer (chairman), who delivered his speech by means of television from the Crystal Palace to Wardour Street, said that Baird television had emerged from the experimental stage, and they were now ready to transmit and receive. A year ago they manufactured sets to receive television on thirty-line definition. They had scrapped them for 180-line definition, which approximated the projection seen in an ordinary film. They were in a position to transmit a programme from the Crystal Palace which would cover the whole of Greater London. At the moment the future of television transmission was so undefined that it was impossible to make a definite pronouncement, but they had mastered transmitted vision and brought it to a commercial stage.

British Insulated Cables, Ltd., reports a profit for 1933 of £517,455, as compared with £589,275 for 1932, to which is added by £301,123 brought in, making £818,578. A sum of £100,000 has been appropriated to depreciation on buildings, plant, machinery &c., £60,000 is placed to reserve, and it is proposed to pay a final ordinary dividend of 10 per cent., making 15 per cent. for the year (unchanged), leaving £300,724 to be carried forward. In view of the depression in trade during the year, the directors consider that the results are good. Meeting: March 27th at Liverpool.

The Mersey Power Co. reports a net profit for the year ended December 31st last of £62,153, as compared with £51,671 in the preceding year. It is proposed to pay an ordinary dividend of 4½ per cent. (against 4 per cent.), and to transfer £10,000 for the amount of the Trade Facilities loan redeemed in August. The balance carried forward is £4,823. During the year the balance of £175,000 of the Trade Facilities loan was paid off, an issue of £250,000 of 3½ per cent. first debenture stock being made, of which the balance was retained for general purposes. Meeting: March 27th.

The Richmond (Surrey) Electric Light & Power Co., Ltd., reports a balance on the 1933 revenue account of £33,988, against £33,492 for 1932, which with £1,413 brought in makes £35,401. Reserve for depreciation, renewals, &c., receives £10,000, and it is proposed to pay a final ordinary dividend of 7 per cent., making 11 per cent. for the year (unchanged), leaving £1,435 to be carried forward. Electricity sold totalled 6,242,661 kWh, as against 5,300,288 kWh in 1932. Meeting: March 27th.

The South Metropolitan Electric Light & Power Co., Ltd., reports a balance upon revenue account for 1933 of £151,557, as compared with £232,332 in the preceding year, to which is added £52,648 brought in, making £204,205. After deducting debenture interest, expenses of debenture issue written off, £62,604 placed to depreciation reserve, £10,000 to tax reserve and £3,807 to contingency reserve, a final ordinary dividend of 6 per cent. is proposed, making 9 per cent. for the year (same), leaving £27,294 to be carried forward. The sales of electricity increased from 65,162,703 to 75,643,432 kWh. Meeting: March 27th.

Aktiebolaget Elektrolux announces a net profit for 1933 of kr. 7,202,541, as compared with kr. 7,045,370 for the previous year, to which is added kr. 2,577,469, surplus from 1932, making kr. 9,780,010 available. It is proposed to set aside kr. 975,000 for taxes, and to maintain the dividend at 8 per cent., the balance carried forward being kr. 4,005,010. The report states that the turnover has increased in all departments.

The South London Electric Supply Corporation, Ltd., reports a net revenue of £95,832 for 1933, as compared with £111,344 in the preceding year; to this is added £28,675 brought in, making £124,508. After deducting debenture interest, &c., it is proposed to pay a final dividend of 4 per cent. on the ordinary shares, again making 7 per cent. for the year, and to carry forward £26,139. The sales of electricity totalled 36,057,214 kWh, as against 36,015,528 kWh in 1932. Meeting: March 27th.

The Hendon Electric Supply Co., Ltd., reports a net revenue for 1933 of £74,123 (against £81,010), to which is added £18,456 brought in and interest (£3,788). The final ordinary dividend is 1s. per share, making 7½ per cent., tax free, on 400,000 shares for the year (against 15 per cent. on 200,000 shares and a capital bonus of 100 per cent.).

The British Aluminium Co., Ltd., reports a net profit for 1933 of £318,856, as against £339,181 in 1932. After providing for debenture interest, taxation, &c., it is proposed to maintain the ordinary dividend at 5 per cent. and to carry forward £52,778, against £51,980. Meeting: March 27th.

The Scottish Power Co. reports a balance on net revenue account for 1933 of £272,941, as against £254,851 in the previous year. To this is added £6,817 brought in, making £279,758. The ordinary dividend is maintained at 8 per cent., less tax, and £7,683 is carried forward.

The Greengate & Irwell Rubber Co., Ltd., shows a profit of £54,494 for 1933 (£49,087 in 1932). The final ordinary dividend is 1s. per share, making 1s. 6d. for the year (same), and £11,762 is carried forward, against £15,418 brought in.

The Fife Tramway Light & Power Co. reports a balance at credit of net revenue account for 1933 of £11,768 (against £16,491), including £1,511 brought in. A dividend of 3½ per cent. is paid (against 4 per cent.) and £1,924 is carried forward.

Waste Heat & Gas Electrical Generating Stations, Ltd., reports a profit to January 31st of £28,821 (against £28,677), plus £26,726 brought in. A final dividend of 5½ per cent. has been declared, making 8 per cent. for the year (same), and £2,784 is placed to reserve, £26,864 being carried forward.

The Mid-Cheshire Electricity Supply Co. announces a net profit for 1933 of £18,648 (against £15,915), after deducting bank interest, &c., and £6,886 for depreciation, plus £3,381 brought forward. The ordinary dividend is maintained at 8 per cent. and £4,533 is carried forward.

Vickers, Ltd., report a net profit for 1933 of £816,362, and after deducting debenture interest, &c., it is proposed to pay an ordinary dividend of 4 per cent. and to carry forward £224,041.

Stocks and Shares

Tuesday Evening.

BUSINESS in the Stock Exchange markets is showing its usual propensity for falling away as the Easter holiday comes into view. Public interest in stocks and shares is now directed more to specialised areas than to the wide field over which investment and speculation were ranging a few weeks ago. The fundamental conditions remain the same as they have been for some time past. Of these, an abundance of capital seeking employment, a gradual increase of trade within the boundaries more particularly of this country, and the constant pressure of necessity for providing money with living rates of interest are the outstanding features. At the same time, the disposition is for investment and speculation to mark time rather than to go ahead in any save a few specialised directions. Borrowers with gilt-edged securities to offer find they have no difficulty in placing their stocks; on the other hand, the public are exercising discrimination, and comparing attentively the differences that prevail amongst gilt-edged stocks in the matter of price and yield.

London Passenger Stocks

London Passenger Transport stocks have received an unusual degree of attention, owing to the sharpness of fluctuation in the prices of the "C" issue. As was mentioned here last week, the price gave way some 9 points owing to a speech by Lord Ashfield in which he referred to the small margin of profit that the Board earns. The fall was followed by a modest rally. Upon apologies in the Press suggesting that Lord Ashfield's speech had been misunderstood, a further recovery took place. At 77¼ the stock shows a point gain on the week, as compared with a fall of 6¼ a week ago. Prices of the Board's prior charge stocks have been a trifle easier.

A rise of 10s. lifted the Central Electricity 3½ per cents to 96. The 5 per cent. stocks of the latter authority hold their recently acquired gains. Of T.F.A. stocks, it may be of use to mention that £700 North Wales Power 4½ per cent. debenture, with May and November interest, and dated 1930-1953, can be bought at 105. This issue can be paid off at any interest date by three months' notice. The estimated life of the stock is 12¼ years, and, taking this as the basis of calculation, a yield of £4 2s. per cent. to redemption can be obtained, the flat return giving £4 7s. per cent. The possibility of the stock

being repaid at an early date, and at 100, has to be kept in mind, of course, by anyone who purchases the stock to-day.

London Electricity Supply

The annual reports of what may be called the County of London Electric Supply group have now been published, and show that expenditure has increased, save in the case of the Richmond (Surrey) Company, in consequence of the larger output of current. The South Metropolitan sold more than ten million units over and above those supplied in the previous years and the dividend is maintained at 9 per cent. South London pays 7 per cent. as before; the figures of the other companies are given elsewhere. The Richmond (Surrey) Electric Light & Power Company has done very well, and the dividend is repeated at 11 per cent. The ordinary shares stand at 56s. 6d.

Metropolitan Electric ordinary, making allowance for deduction of the dividend, are lower at 53s. 9d. Most of the ordinary shares in this section are now quoted ex the dividends for the final half of 1933.

London Electric Supply Corporation ordinary have eased off to 76s. 3d. Permission to deal in 18,000 new ordinary shares of £1 each was granted by the Stock Exchange Committee a few days ago. These shares were issued to pay for a fresh purchase which the Electric Supply Corporation has been negotiating. North Metropolitan Electric ordinary are 1s. 9d. easier at 63s. 3d.

A noticeable feature in this group of shares is the rising trend of preference prices. Within the past few business days the preference issues of a number of electricity supply companies have been advanced, as a rule by sixpence to a shilling each.

Provincial Shares

The Bournemouth & Poole dividend is to be maintained at 15 per cent. The price of the shares has reacted to 78s. 9d. Electrical Distribution of Yorkshire and Yorkshire Electrics are both a trifle lower, after their recent rises, and Lancashires eased off to 38s. 9d. Scottish Power at 2$\frac{1}{16}$ show $\frac{1}{16}$ decline. West Gloucestershire ordinary stock, on the other hand, is 2 points higher at 74, and the 6$\frac{1}{2}$ per cent. preference follows up its last week's rise of 5 points with an advance of 1, to 113. Llanellys at 26s. 9d. and Edmundsons at 41s. 3d. show respective gain and decline of a few pence.

British Power & Light firmed up to 21s. 3d. Atlas are quiet at 8s. 6d. In the Colonial list, Victoria Falls ordinary rose $\frac{1}{8}$ to 5$\frac{3}{4}$.

Cables and Wireless

The February index number of Imperial & International Communications shows an increase of nearly 3 points, at 74.7 over that of January this year. Previous to this being announced, prices of Cables & Wireless had been dull, but the losses were recovered upon publication of the index number. Globe ordinary and preference are both quoted ex dividend this week. Gt. Northerns at 37$\frac{1}{2}$ have continued their advance. The Jutland Telephone 5$\frac{1}{2}$ per cent. bonds of 1922 and 1925, quoted nominally at 104$\frac{1}{2}$, are to be repaid at 100 in six months' time. Holders will be given the option of retaining their bonds, provided they will accept 4$\frac{1}{2}$ per cent. interest, instead of 5$\frac{1}{2}$ per cent. Anglo-Portuguese Telephone 5$\frac{1}{2}$ per cent. debenture stands at 106, the shares at 28s. The dividend on the latter is to be repeated at 8 per cent. The Board proposes to create 250,000 new shares, raising the company's capital to the full authorised amount of £1,100,000.

London and New York

The controversy raised by the American cable companies increasing their rates from the beginning of the year has by no means died down. Meetings are being held every week. The various interests are spread widely, the Continent being almost equally as interested as this country in the matter of cable rates to the United States. Questions have been asked in Parliament with the idea of obtaining information regarding the rights of British companies to lay cables into New York, and the replies from the Postmaster-General have left room for doubt on the subject. The Imperial & International Communications is, however, about to open a Stock Exchange office under the shadow of the House, and to take its place with the cable companies that are working under American auspices. At present, messages sent by the Imperial & International Communications have to go by radio to New York. The concern has a cable to Canada, but it would not be surprising if Cables & Wireless were to apply for permission to lay a cable into New York, although American opposition can readily be envisaged.

Manufacturing and Equipment

British Aluminium ordinary have been a dull market, falling half a crown to 29s. 6d. upon disappointment with the dividend of 5 per cent., the same as that of a year ago. The net profits of £112,159 are about £800 better than those of 1932. Associated Electrical Industries have weakened to 17s. 9d. Siemens went back to 19s. 6d., Johnson & Phillips to 21s. 3d. Higher-priced shares in this market, British Insulated, Callenders, Enfields and Henleys, have held their previous levels. International Automatic Telephone ordinary rallied to 36s. 3d. and the deferred to 35s. now that the dividend cut, from 10 per cent. to 8 per cent., has become digested. Enfield Rolling Mills are a little easier at 30s. 3d. Associated Equipment keep steady at 33s. 9d. Sharp rises in Baird Televisions lifted the preferred and deferred to 3s. 6d.

Share List of Electrical Companies

Home Electricity Companies.

	Nom.	Dividend. 1932.	Dividend. 1933.	Price. Mar. 20.	Rise or Fall.	Yield. £ s. d.
Bournemouth and Poole	1	15	15	78/9	−$\frac{1}{8}$	3 16 2
Brompton Ordinary	1	7	7	34/6	—	4 1 2
Charing Cross Ordinary	1	7	7	35/6xd	+6d.	3 19 0
Chelsea	1	7	7	35/-	+6d.	4 0 0
City of London	1	7$\frac{1}{2}$	7$\frac{1}{2}$	37/-	—	4 1 1
Clyde Valley	1	7	7	42/-	—	3 6 8
County of London	1	10$\frac{1}{2}$	10$\frac{1}{2}$	59/6	−6d.	3 11 0
Edmundson's 7% Pref.	1	7	7	34/-	—	4 2 4
Elec. Dis. Yorkshire	1	9	9	48/3xd	−1/-	3 14 9
Elec. Supply Corporation ...	1	11	11	76/3	−$\frac{1}{8}$	2 17 8
Kensington Ordinary	1	7	7	35/-xd	—	4 0 0
Lancs Light and Power	1	7	7$\frac{1}{2}$	38/9	−$\frac{1}{8}$	3 17 4
London Electric	1	7	7	35/6xd	+6d.	3 19 0
Metropolitan	1	10	10	53/9xd	−$\frac{1}{8}$	3 14 3
Midland Counties	1	7	7	40/0xd	—	3 10 0
Mid. Elec. Power	1	8	8	43/9	—	3 13 0
North Eastern Electric Ordinary	1	6	6	35/6	−6d.	3 7 8
Do. 7% Pref.	1	7	7	34/6	+6d.	4 1 2
Northampton	1	10	10	56/3	−$\frac{1}{8}$	3 11 3
Notting Hill 6% Pref.	10	6	6	13$\frac{1}{2}$	—	4 8 11
North Met. Elec. Ordinary ...	1	10	10	63/3	−1/9	3 3 5
Do. do. 6% Pref. ...	1	6	6	30/6	+6d.	3 18 8
St. James' and Pall Mall ...	1	7	7$\frac{1}{2}$	36/-	—	4 3 4
Scottish Power	1	8	—	2$\frac{1}{2}$	−$\frac{1}{8}$	3 15 6
South London	1	7	7	35/6	+6d.	3 19 0
Westminster Ordinary	1	7	7	35/-	—	4 0 0
Whitehall Elec. Invst. 7$\frac{1}{2}$% Pref.	1	7$\frac{1}{2}$	7$\frac{1}{2}$	22/-xd	+6d.	6 16 4
Yorkshire Elec.	1	8	8	49/6	−6d.	3 4 9

Public Boards.

		1931.	1932.			
Central Electricity, 1950–70 ...	Stock	5	5	113	—	4 8 6
Do. 1955–75 ...	„	5	5	114	—	4 7 9
Do. 1951–73 ...	„	4$\frac{1}{2}$	4$\frac{1}{2}$	108	—	4 3 4
Do. 1963–93 ...	„	—	3$\frac{1}{2}$	96	+$\frac{1}{2}$	3 13 0
London & Home Counties, 1955–75	„	4$\frac{1}{2}$	4$\frac{1}{2}$	109	—	4 2 7
London Passenger Transport, A...	„	—	4$\frac{1}{2}$	118$\frac{1}{2}$	—	3 16 0
Do. do. B...	„	—	5	120$\frac{1}{2}$	−1	4 3 0
Do. do. C...	„	—	—	77$\frac{1}{2}$	+1	—
West Midlands Joint Elec. 1948–68	„	—	5	113	—	4 8 6

Telegraph and Telephones.

American Tel. & Tel.	$100	9	9	117$\frac{1}{2}$	−5	7 13 3
Anglo-Am. Tel. Pref.	Stock	6	6	113xd	+$\frac{1}{2}$	5 6 2
Do. Def.	„	1$\frac{1}{2}$	1$\frac{1}{2}$	28	—	5 7 2
Cables & Wireless 5$\frac{1}{2}$% Pref. ...	„	2$\frac{1}{2}$	2$\frac{1}{2}$	73$\frac{1}{2}$	—	3 14 10
Do. A 7$\frac{1}{2}$% Ord.	„	Nil	Nil	23$\frac{1}{2}$	+$\frac{1}{2}$	—
Do. B. Ord.	„	Nil	Nil	10$\frac{1}{2}$	—	—
Globe Tel. and T. Ord.	10	Nil	2$\frac{1}{2}$	9$\frac{1}{2}$xd	—	2 11 3
Do. do. Pref.	10	6	6	12$\frac{1}{2}$xd	—	4 13 4
Great Northern Tel.	10	20	20	37$\frac{1}{2}$	+$\frac{1}{2}$	5 6 8
Marconi-Marine	1	10	7$\frac{1}{2}$	28/9	—	5 4 2
Oriental Telephone Ord.	1	12	12	3$\frac{1}{4}$	—	*3 16 10

Home and Foreign Trams, Etc.

Anglo-Arg. Trams First Pref. ...	5	Nil	Nil	2/-	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	6	—	—
British Electric Traction Df. Ord.	„	5	5	580	−10	—
Do. do. Pref. Ord.	„	8	8	157$\frac{1}{2}$	—	5 1 7
Brazil Traction	100	—	—	11$\frac{1}{2}$	−$\frac{1}{2}$	—
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	102$\frac{1}{2}$	—	4 17 6
Mexico Trams, 5% Bonds ...	—	5	5	19$\frac{1}{2}$	—	25 12 8
Mexican Light Common	100	Nil	Nil	8	—	—
Do. 7% Pref.	100	7	7	11	—	—
Do. 1st Bonds...	—	5	5	50$\frac{1}{2}$	—	9 18 0
Victoria Falls Ord.	1	15	20	5$\frac{1}{2}$	+$\frac{1}{8}$	3 9 7
Yorkshire (West Riding) ...	1	2$\frac{1}{2}$	5	18/9xd	—	5 6 8

Manufacturing Companies.

Assoc. Elec. Ord.	1	4	4	17/9	−6d.	4 10 2
Do. Pref.	1	8	8	31/3	—	5 2 5
Babcock & Wilcox	1	14	9	44/6	—	—
British Aluminium Ord.	1	5	5	29/6	−$\frac{1}{4}$	3 7 9
British Insulated Ord.	1	15	15	72/6	—	4 2 8
Brush Ord....	Stock	Nil	Nil	40	—	—
Callender's	1	15	15	61/3	—	4 18 6
Do. 6$\frac{1}{2}$% Pref.	1	6$\frac{1}{2}$	6$\frac{1}{2}$	30/9	—	4 4 6
Crompton Parkinson Ord. ...	5/-	22$\frac{1}{2}$	12$\frac{1}{2}$	25/-	—	—
Do. 8% Pref.	1	8	8	31/3	—	5 2 5
Edison-Swan 1st Pref.	1	7$\frac{1}{2}$	7$\frac{1}{2}$	24/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102$\frac{1}{2}$	—	4 17 7
Electric Construction	1	Nil	Nil	10/-	—	—
Enfield Cable Ord.	1	25	25	85/-xd	—	4 14 1
English Electric	1	Nil	Nil	6/3	—	—
Do. do. Pref.	1	Nil	Nil	8/9	—	—
Ever Ready	5/-	35	35	29/6	−6d.	5 18 8
Ferranti Pref.	1	7	7	26/-	—	5 7 9
G.E.C. Pref.	1	6$\frac{1}{2}$	6$\frac{1}{2}$	30/-	—	4 6 8
Do. Ord....	1	8	8	43/9	—	3 13 1
Henley's	1	30	30	6$\frac{1}{2}$	—	4 17 10
Do. 4$\frac{1}{2}$% Pref....	5	4$\frac{1}{2}$	4$\frac{1}{2}$	5$\frac{1}{2}$	—	4 5 9
India-Rubber Preferred	1	—	—	15/-	—	—
Johnson & Phillips	1	5	5	21/3	−$\frac{1}{8}$	4 14 1
Siemens Ord.	1	7$\frac{1}{2}$	6$\frac{1}{2}$	19/6	−6d.	—
Telegraph Construction	£1	Nil	Nil	25/-	—	—

* Dividends paid free of Income Tax

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1932

17331. "Thermionic valves and circuit arrangements therefor." S. F. Warren and W. L. J. Woods. June 18th, 1932. (406292.)

20346. "Loud-speaker diaphragms." W. W. Triggs (Lohusta Elektro-Akustick Ges.). July 18th, 1932. (Convention date not granted.) (406327.)

22706. "Electric switches of the ironclad or enclosed type for use in cooker-control and similar circuits." J. A. Crabtree. August 13th, 1932. (406266.)

23054. "Protective devices for the motor controllers of electrically propelled vehicles." Sunbeam Motor Car Co., Ltd., and G. Matthews. August 17th, 1932. (406297.)

23056. "Electric transformers." Ferranti, Ltd., and W. E. Tilley. August 17th, 1932. (406279.)

23057. "Machine for removing the covering from and/or cleaning the surface of electrical conducting wires or for cleaning metal surfaces." S. R. Caplin. August 17th, 1932. (Cognate application 21961/33.) (406298.)

23394. "Telephone systems." Automatic Electric Co., Ltd., F. T. Belas and G. T. Baker. August 20th, 1932. (406270.)

23395. "Methods and devices for traffic signalling." J. L. B. Jayne. August 20th, 1932. (406285.)

23341. "Cathode-ray tubes and the like." Electric & Musical Industries, Ltd., W. F. Tedham and J. D. McGee. August 25th, 1932. (406353.)

23877. "Electrical measuring instruments." Standard Telephones & Cables, Ltd., and E. J. Tervet. August 26th, 1932. (406360.)

23878. "Signalling systems, particularly party-line telephone systems." Standard Telephones & Cables, Ltd. March 2nd, 1932. (406361.)

23879. "Radio signalling systems." Standard Telephones & Cables, Ltd., B. J. Axten and D. Hamilton. August 26th, 1932. (406362.)

23892. "Carrier telegraph receiving systems." Standard Telephones & Cables, Ltd., and B. B. Jacobsen. August 26th, 1932. (406366.)

23933. "Television and like systems." Marconi's Wireless Telegraph Co., Ltd., H. M. Dowsett and R. Cadzow. August 26th, 1932. (406368.)

24851. "Electric insulators." International General Electric Co., Inc. September 10th, 1931. (406387.)

25444. "Electric contact-making devices." British Insulated Cables, Ltd., and G. H. Nisbett. September 13th, 1932. (406390.)

29027. "Oscillating electric motors." W. J. Tennant (Etablissements E. Jaeger). October 17th, 1932. (Convention date not granted.) (406409.)

29682. "Insulation of windings for high-frequency electric furnaces." General Electric Co., Ltd., and G. G. Morris. October 24th, 1932. (406412.)

29717. "Electric discharge devices." British Thomson-Houston Co., Ltd. October 24th, 1931. (406413.)

30567. "Traffic control installations, more particularly for railways." General Railway Signal Co. November 5th, 1931. (406418.)

30730. "Electric insulators." J. Holzel and Akt.-Ges. Brown Boveri et Cie. November 1st, 1932. (406419.)

30893. "Electric motor controllers." R. Brooks and Associated Electrical Industries, Ltd. November 2nd, 1932. (406421.)

31090. "Aerials or conductors in wireless apparatus." M. H. Goldstone. November 4th, 1932. (406424.)

31960. "Electric measuring instruments." International General Electric Co., Inc. November 11th, 1931. (406429.))

32082. "Method of producing high-emission thermionic cathodes." Radioakt-Ges., D. S. Loewe and Dr. E. Waldschmidt. November 16th, 1931. (406431.)

32839. "Carbon elements employed in electric arcs." C. H. Champion & Co., Ltd., and C. H. Champion. November 21st, 1932. (406434.)

33154. "Snap-action electric switches and the like." J. T. Boardman and Associated Electrical Industries, Ltd. November 23rd, 1932. (406437.)

1933

293. "Breastplate telephone transmitters." Siemens Bros. & Co., Ltd., and E. A. Forceville. January 4th, 1933. (406454.)

1114. "Automatic electric circuit-breakers." British Thomson-Houston Co., Ltd. January 13th, 1932. (406457.)

3518. "Heat-indicating devices pertaining to electric, gas or oil stoves and the like." Thermostatics, Ltd., and F. Miller. February 6th, 1933. (406466.)

5667. "Device for fixing lamp shades or other bodies to electric lampholders." T. Cracknell. February 24th, 1933. (406476.)

6463. "Electric supply systems for the lighting of machinery and other purposes." T. Robinson & Son, Ltd., F. B. Robinson and J. Tweedale. March 3rd, 1933. (406481.)

6650/1. "Electric motor control systems." British Thomson-Houston Co., Ltd. March 5th, 1932. (406482/3.)

7172. "Electrical measuring instruments." Westinghouse Electric & Manufacturing Co. March 18th, 1932. (406486.)

9131. "Traffic-directing apparatus or beacons for road use." L. Milner, R. P. Williams and F. G. Markin. March 27th, 1933. (406494.)

11162. "Electric starting means for internal combustion engines. Fairey Aviation Co., Ltd., and A. G. Forsyth. April 13th, 1933. (406502.)

12090. "Manufacture of photo-electric cells." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. July 26th, 1932. (Addition to 343930.) (406507.)

14502. "Hand tools such as drilling machines having a built-in electric motor." R. Bosch Akt.-Ges. June 30th, 1932. (406521.)

14832. "Aerial for wireless reception." E. E. Gale. May 23rd, 1933. (406526.)

17161. "Telephone systems." Automatic Electric Co., Ltd., G. T. Baker and F. Belas (legal representative of F. T. Belas (deceased)). August 20th, 1932. (Divided application on 406270.) (406274.)

20303. "Electrical heating resistance for the production of high temperature." Carbo-Keramik Akt.-Ges. July 18th, 1932. (Cognate applications, 20304/33 and 20305/33.) (406567.)

20863. "Piezo-electric crystal arrangements." Telefunken Ges. für Drahtlose Telegraphie. July 22nd, 1932. (406572.)

21575. "Cord- or chain-operated electric switches." C. H. Parsons, Ltd., and G. B. Handley. August 1st, 1933. (406576.)

23055. "Wireless aerials." A. F. Kent. August 18th, 1933. (406588.)

23388. "Quick-action device for actuating barrel-type switches provided on electrically driven tools." Siemens-Schuckertwerke Akt.-Ges. August 22nd, 1932. (406287.)

27067. "Luminous electric discharge tubes." General Electric Co., Ltd. October 1st, 1932. (406611.)

28633. "Electric variable condensers." P. Grassmann. October 16th, 1933. (406615.)

29703. "Electric discharge tubes." General Electric Co., Ltd. October 28th, 1932. (406620.)

35640. "Alternating-current dynamo-electric machines." A. F. Fekete. May 20th, 1932. (Divided application on 14341/32.) (406275.)

36122. "Television." Pye Radio, Ltd., and Dr. P. C. Goldmark. July 20th, 1932. (Divided application on 20502/32.) (406288.)

1934

1729. "Machines for winding electrical coils." Universal Winding Co. April 9th, 1932. (Divided application on 20431/32.) (406323.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from March 14th:—

Luxo, No. 539631, and Solar, No. 539632. Class 4. Electric carbons.—Charles H. Champion & Co., Ltd., National House, 60-66, Wardour Street, W.1.

Ace (lettering and spade design). No. 544557. Class 8. Parts of telephonic receiving sets.—Marcus, Overton Radio, Ltd., 62, Borough High Street, S.E.1.

Tym-Flex. No. 548522. Class 8. Loud-speaking telephones and parts thereof.—Jensen Radio Manufacturing Co., Chicago. (British representatives: Dicker, Pollak & Mercer, 20-26, Holborn, E.C.1.)

Instasig. No. 548305. Class 18. Signalling system.—Instanta Electric Signal Clocks, Ltd., 1, St. Paul's Churchyard, E.C.4.

The First Berlin Trolley-bus Service

THE experimental trolley-bus line between Spandau (main railway station), Berlin, and Staaken traverses dense traffic in Spandau, passes through outer districts of suburban character and reaches rural settlement conditions in the Staaken district.

The initial equipment, says *Elektrotechnische Zeitschrift*, comprises three six-wheeled, single-deck buses, each accommodating seventy passengers. A 550-V double traction motor containing two electrically distinct parts in a single housing develops 2 by 41 kW at 1,500 r.p.m., one-hour rating, and 2 by 34 kW continuously, corresponding to a steady speed of 30 miles an hour on the level. The journey speed is 11.2 miles an hour.

The motor is suspended between the front and rear axles, and power is transmitted from it through a short shaft with two joints to a dividing gear, whence two parallel cardan-shafts each drive one of the rear axles. Part of the gear reduction is effected at the axles, thus decreasing the size of the primary gear box. Contactor-type control gear is employed, and the driver's pedal (corresponding to the accelerator of an internal-combustion-engined vehicle) has five positions for series and four for parallel operation of the double motor. The passenger space is heated by six 750-W heating elements, and the driver's compartment by one 375-W element. The main lighting supply is taken from the trolley wire, but a 12-V lighting set is carried for emergency service.

The weight of the chassis, including electrical equipment, amounts to 5 tons 18 cwt.; the body weighs 2 tons 19 cwt.; and the total weight of the vehicle, fully laden, is 13 tons 15 cwt., of which 4 tons 8 cwt. is carried by the front and 9 tons 7 cwt. by the two rear axles. A two-wire overhead system is provided for each direction of running, using 0.124 sq. in. oval conductors of great lateral stiffness. Energy is drawn from the "Bewag" tramway sub-station at Spandau for the city service, the rest of the line being fed from the 6-kV network through a new mercury-rectifier sub-station at Neu-Staaken, containing two glass-bulb rectifiers each rated at 350 A, 600-620 V.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Annan.—Houses (66); burgh surveyor.

Ashby-de-la-Zouch.—Houses, Burton Road; housing architect.

Birmingham.—Factory, Shaftmoor Lane, Acock's Green (£15,000), with electrical work; Whittalls & Son, builders, Lancaster Street. Factory, Tyburn Road, for the British Electric Furnaces, Ltd.; Maddocks & Walford, builders, Tyburn Road.

Bolton.—School, Tonge Moor; Rev. J. O'Dwyer, St. Columbia Rectory. Enlargement to Sharples Holy Infants' Catholic School; managers.

Boston.—Houses (28), Kings Pit Lane, for F. Peck & Son.

Bournemouth.—Shops and flats, Leybourne Estate and Southcliff site; Fox & Sons.

Bridlington.—Senior school, Queensgate (400 places), for Borough E.C.; P. M. Newton, borough architect.

Brighton.—Technical College extensions (£18,600) for Borough E.C.; director of education.

Burnley.—Houses, Coalclough Farm Estate; A. Race, borough surveyor.

Cakemore.—School extension (£3,589); J. Hickman & Son.

Cannock.—Houses (150), Belt Road, Hednesford, for A. J. Pace. Houses (60), Pye Green Road, for W. Winsper.

Carlisle.—Houses (80), Currock Estate; city engineer. Buildings, Blackwell Road; Johnstone & Parkin. Estate development of Brunton Crescent; C. J. F. Martindale. Two schools and alterations to Grammar and Girls' High Schools; offices, City Chambers.

Chard.—Houses (24); borough surveyor.

Cheadle (CHESHIRE).—Houses (800), Adswood Hall Farm Estate, for Adswood Estate, Ltd.; J. Lloyd Edwards, architect, Mosley Street, Manchester.

Cheltenham.—Houses (24), Hesters Way; Mark Williams & Co. Houses (156), the Moors; borough surveyor.

Cheshire.—School extensions, Oldfield Brow, Altrincham, for County E.C.; F. A. Browne, county architect, the Castle, Chester. School, Ellesmere Port (£23,175), for County E.C.; H. Fairclough, builder, Warrington.

Chesterfield.—Houses (134), Springfield Avenue Estate; borough engineer.

Colchester.—Houses (46); H. Collins, borough engineer.

Cradley Heath (STAFFS).—Factory for E. Stevens, Ltd. (£15,000), with electrical work; Cherrington and Stainton, architects, 133, Edmund Street, Birmingham.

Cumnock.—Houses (60), Barr Park; R. Forbes, burgh surveyor, Town Hall.

Dalkeith.—Houses (80); burgh surveyor.

Dartford.—Houses (14), Chatsworth Road; W. G. Cooper.

Derbyshire.—School (150 places), Rotherham Road, Pleasley, for County E.C.; director of education, Derby.

Douglas (I.O.M.).—Estate development, Ballabrooie; J. R. & R. C. Drinkwater.

Dudley.—Factory, Oakeywell Street, for Pearce & Sanders, Ltd., Worcester.

Dumbarton.—Extension to the Joint Hospital (£5,200); burgh surveyor, Municipal Buildings.

East Grinstead.—Houses (£11,984); David Kenn & Sons, Ltd., builders, High Street, Bexley.

East Sussex.—School, Seaford, for County E.C.; director of education, Lewes.

Eccles (LANCS).—Branch library, &c., Winton; borough surveyor. Employment exchange, Corporation Road, for H.M. Office of Works, King Charles Street, London, S.W.

Edinburgh.—Thirteen shops, offices, &c., Corstorphine; Anderson & Walker, 130, George Street. School, janitor's house, &c., Niddrie Mains Road; T. Aikman Swan, architect, 7, St. Colme Street.

Farnborough (HANTS).—Houses (32), Orchard Road and Victoria Road, for T. H. Jones.

Folkestone.—Cinema, Sandgate Road, for Sandgate Road Cinema Co.; secretary.

Glasgow.—Houses (7,000); Housing department, 20, Trongate. Works extensions, Helen Street; British Oxygen Co., Ltd.

Gosforth.—Cinema for the Gosforth Royalty Cinema, Ltd. (1,400 places); W. Hall (Contractors), Ltd., Derwentwater Road, Gateshead.

Grimsargh.—Factories for Courtaulds, Ltd., Coventry.

Hamilton.—Houses (46) and shops, Gateside Street; W. H. Purdie, burgh surveyor, Municipal Offices.

Haslingden.—Houses (40), borough surveyor.

Hatfield.—Houses (200), Birchwood Garden Estate; Miskin & Sons, builders, St. Albans.

High Wycombe.—School (960 places), for Borough E.C.; F. Britnell.

Inverness.—Houses (80); county architect.

Irvine.—Houses (100); W. L. Weir, burgh surveyor, Town Hall.

Kent.—Central schools, Sandwich; director of education, Maidstone. Enlargement to Council School, Halstead, and Barnehurst School, Crayford; county architect, Maidstone.

Kidderminster.—Houses (21); Miss A. A. Spilsbury. Telephone Exchange, Blackwell Street, for H.M. Office of Works, King Charles Street, London, S.W.

Kirkintilloch.—Houses (100), Woodhead; Jas. Coates, burgh surveyor, Council Chambers.

Lancashire.—Senior school, Brierfield, for County E.C.

Leeds.—Houses, Ivy House Estate; W. Jowitt.

Lincoln.—Houses, Bracebridge Manse Estate; city surveyor. Orphan home and nursery, Macaulay Drive, for Public Assistance Committee. Extensions to canning works, Bardney, for A. W. Foster & Co., Ltd., Morison Street; William Wright & Son (Lincoln), Ltd., builders, 4, West Parade.

Littlehampton.—Houses (51), Lyminster Road; A. R. Dairy, Ltd. Houses (43), Milton Avenue; C. Swain.

Liverpool.—R.C. school, Orrell Estate, for Rev. R. Coupe, of St. Robert Bellarmines; C. Doyle & Son, builders, 15, Victoria Street.

London.—(ACTON).—Houses (54), Canada Road; borough engineer. Houses (48), Western Avenue; W. Atkinson. Factory for Lazarus, Ltd., Chase Road; F. E. Simpkins, architect. (DEPTFORD).—Central maternity and welfare clinic; borough engineer. (EALING).—Houses (140), Burnham Way, &c.; A. J. Ginger, Norwood Green, Southall. Houses (68), Clarendon Road; B. Smith (Builders), Ltd. Development of Greystone Park Estate; E. Smith & Son (Builders), Ltd. Block of flats, Longfield Avenue and showrooms and flats, Uxbridge Road; E. Schaufelberg, architect. Factory, Long Drive; Dental Products, Ltd. Factory, Wadsworth Road; Tillett, Ltd. (LEWISHAM).—Clinic and dispensary, Priory site; borough engineer. Operating theatre, Poor Law Institution (£9,195); L.C.C. architect. Five shops, Lewis Grove; P. W. Davis. Shops and flats, Stondon Park and Brockley Rise; Kersey, Gale & Spooner. (ST. JOHN'S WOOD).—Flats, Frederick Street and Henry Street; H. Kempson Dyson, architect. (ST. MARYLEBONE).—Flats, Albert Road and Eumont Street; R. J. Minty. (SHOREDITCH).—Premises for Brown Bros., Ltd., Gt. Eastern Street; R. J. & J. R. Girling, architects.

Maidstone.—Employment exchange for H.M. Office of Works; W. W. Martin, builder, Ramsgate.

Manchester.—Houses (452), Brownley Green, Northenden; city surveyor. Bank, Moston, for the Westminster Bank, Ltd., 41, Lothbury Street, London, E.C.2; A. E. Shennan, architect, North House, 17, North John Street, Liverpool.

March.—Bank, Broad Street, for the National Provincial Bank, Ltd.

Middlesbrough.—Extensions to the maternity home (£5,500); S. E. Burgess, borough engineer.

Midlothian.—School, Penicuik, for C.C. (£31,000); Offices, County Rooms, Edinburgh.

Morley.—Science block, Victoria Road Elementary School; F. Turner, borough engineer, Town Hall.

Newcastle-on-Tyne.—Houses (118), near Druridge Drive; Kirk and Dickinson, builders, Regent Terrace, New Bridge Street.

Northfield (NEAR BIRMINGHAM).—Cinema, Barnes Hill (£22,000), with electrical work; Hodge Bros. (Contractors), Ltd., Cock Lane.

Northfleet (KENT).—Houses (26); J. A. Mitchell, U.D.C. surveyor.

Northolt.—Development of Moat Farm Estate; Roper, Son & Chapman, 162, High Street, Hounslow.

Norwich.—Infants' school, Catton Grove (£6,104), by direct labour; city engineer.

Oldbury.—Houses (100); U.D.C. surveyor.

Paignton.—Houses (82), Ailescombe Road; W. S. Coates. Houses (65), Colley End Road; Eastley & Co. Houses (151), Kings Ash Road, &c.; the Co-operative Society, Ltd. Houses (57), Marldon Road; A. Langer.

Renfrew.—Houses (68), Porteyfield Road; burgh surveyor, Town Hall.

Rushden.—Houses (66), Irchester Road Estate; J. W. Lloyd, U.D.C. surveyor, Council Buildings.

St. Albans.—Houses (100), Batchwood Estates, Ltd.; secretary.

Salisbury.—Houses (42), Pembroke Park Estate; city engineer.

Sedgley.—Works extensions, Turl Street; Beacon Bedstead Co.

Spalding.—Houses (50); U.D.C. surveyor.

Spittal (BERWICKSHIRE).—Bacon factory, Sandstell Point (£4,000), with electrical work, for H. Taylor, Berwick-on-Tweed.

Standish.—Houses (42); H. Darbyshire, builder, Wigan Road.

Stockton-on-Tees.—R.C. schools, Ragworth Road, Norton; priest-in-charge of St. Joseph's.

Sunderland.—Houses, Seaburn Estate; W. Purvis, builder, Brown Road. Houses (92), Tunstall Road; Randle & Co., builders, Dunelm Street. Public swimming baths, Newcastle Road (£26,580); Henderson Bros., builders, Smith Street, Tyne Dock.

Surbiton.—Houses (80); U.D.C. surveyor.

Sutton.—Baptist church (£30,000); Welch, Cachemaille-Day & Lander, architects.

Torquay.—Estate development of Maidencombe; J. T. Hanbury.

Tunbridge Wells.—Cinema (£75,000), Parham House site, for the Union Cinema Co., Wardour Street, London, W.

Tynemouth.—Development of Tynemouth Park Estate; St. Dunston Estates, Ltd.

Wallsend.—Houses (36), King's Road Estate; W. C. Leech. Branch library; J. A. Blench, borough engineer.

Warwick.—Houses (24), Anchorage Road, for Stivichall Hall Estate; J. T. Brooks.

Watford.—Houses (35), Kingswood Estate; Hillingdon Estate Co. Factory extension, Vicarage Road; Watford Printers, Ltd.

Wellingborough.—Houses (102), Priory Road (£26,954); Eadie & Co.

West Kirby.—Extensions to nurses' home for the Children's Convalescent Home Board of Management; Captain J. J. Green, architect, 21, Harrington Street, Liverpool.

Weston-super-Mare.—Hospital extensions, including administrative and cubicle blocks; H. A. Browne, U.D.C. surveyor.

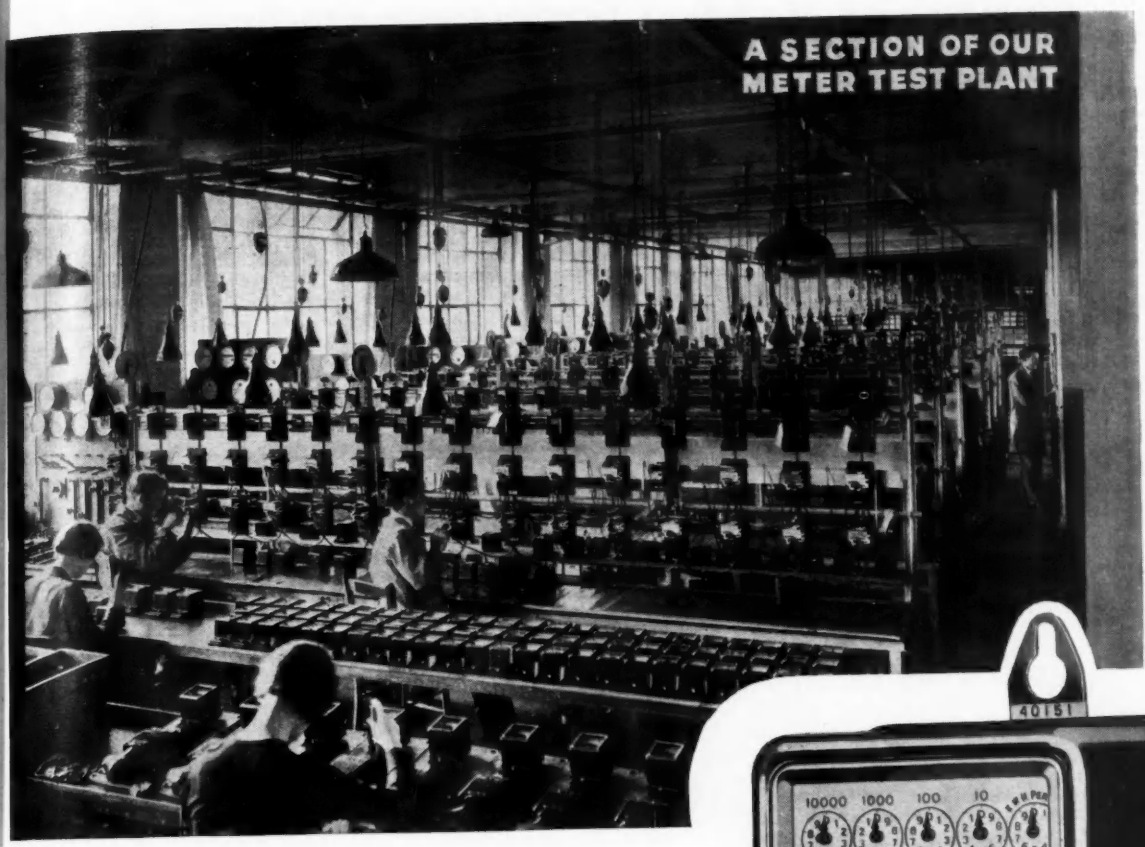
West Sussex.—Extensions, Poor Law Institution, Midhurst; High School for Girls, Horsham; Knoll School, Hove; and Boys' Secondary School, Worthing; county architect, Chichester.

West Wickham (KENT).—Bazaar stores for F. W. Woolworth & Co., Ltd., London.

Whitwood.—Houses and shops, Three Lane Ends; Blenkinsopp & Scatchard, architects, Midland Bank Chambers, Castleford.

Wigtownshire.—School, Stranraer (£20,000), for C.C.; R. G. Logon, chartered architect.

Wrexham.—Flats, Aston Park Estate; Lockwood, Abercrombie & Saxon, architects, Cathedral Chambers, Chester.



SCIENTIFIC
MANUFACTURING METHODS *plus* FINEST MATERIALS PRODUCE

SIEMENS
BRITISH MADE
HOUSE SERVICE METERS

APPROVED BY THE ELECTRICITY COMMISSIONERS

MADE THROUGHOUT AT THE WOOLWICH WORKS OF SIEMENS BROTHERS & CO., LTD., LONDON S.E. 18.

Adver of SIEMENS ELECTRIC LAMPS AND SUPPLIES LIMITED. 38/39, Upper Thames Street, London, E.C.4.
Branches at-Belfast, Birmingham, Bristol, Cardiff, Dublin, Glasgow, Leeds, Liverpool, Manchester, Newcastle-on-Tyne, Nottingham, Sheffield, Southampton

COMPANY MEETING.

THE COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD.

A Notable Record.

The fortieth ordinary general meeting of the County of London Electric Supply Co., Ltd., was held on March 20th at River Plate House, London, E.C.

Sir Bernard E. Greenwell, Bt., chairman, in the course of his speech, said: The number of units sold by the company in 1933 amounted to 693,374,135 an increase of 14.7 per cent. over the previous year. A very substantial increase in the number of new consumers is to be recorded. The total receipts for the year, £2,807,032, as compared with £2,530,829 in the preceding year, is a greater increase in gross revenue than last year. The amount transferred to net revenue account, namely, £1,721,489, shows an increase of £161,968 over the year 1932. The dividend proposed at 10½ per cent., although the same as for last year, is on an increased capital. The receipts from sale of current and meter rentals, after making provision for bad and doubtful debts, total £2,536,348, as against £2,297,256 for the previous year, an increase of over 10 per cent.

The balance carried to net revenue account of £1,721,489 shows an increase for the year of £161,968. An amount of £489,109 has been transferred to reserve for depreciation, including sinking funds, and there is now a total of over £2,900,000 in this reserve. To reserve, in one form or another, an amount of £169,635 out of the profits for the year is placed.

The net expenditure during the year amounts to £1,076,747. due, in part, to further payments made in respect of the new section of Barking power house, and there is the usual expenditure on the distribution system, which is necessary to deal with the rapid development taking place in all the areas of the company. The total expenditure now amounts to £18,040,582. Investment reserve account amounts to £203,256. General reserve amounts to £300,000, an increase of £50,000 for the year.

BARKING POWER STATION.

The completion of the new section of Barking power station was a big step forward. The two new 75,000-kW sets are running to-day, and the station now has a capacity of 390,000 kilowatts, and has become not only the largest station in this country but the largest in Europe on one site. The working of the station during the year was maintained without interruption.

There was actually a reduction in the total works costs per unit sent out as against previous years, although the running in and tuning up of our new plant caused a very slight increase in the consumption of coal per unit sent out. Not only does a low cost save capital and interest, but it reduces the necessary amount which has to be put to depreciation every year. As this is in the neighbourhood of 3 per cent. £1 per kilowatt saved on the 150,000 kilowatts installed in this new station would mean a saving of £4,500 a year in depreciation, and if the station was doubled and the cost reduced from £14 to £12, it would mean no less a sum than £18,000 a year saving on depreciation.

EFFICIENT OPERATION.

Efficient figures so far attained are remarkably good, and indicate that the operation of the station will result in the production of electricity at the lowest possible cost. New work has involved the laying of some thirty-one miles of high-tension transmission and the establishment of over eighty new transforming stations, and 245 miles of medium and low pressure distributing works for new consumers and new areas.

Growth of output has trebled itself in six years, and output last year was more than ten times what it was ten years ago. As from January 1st this year Barking and Wandsworth power stations began operations under the provisions of the Electricity (Supply) Act, 1926. Barking power station forms the main source of generation for the South-East England and the East England schemes of the Central Electricity Board. In association with the Grid such highly efficient stations enable the Central Board to become wholesalers in the fullest sense of the term.

During the year the company absorbed further territories. They comprise a small area near Ilford; the town and surrounding district of Saffron Walden, and the Caterham and Woldingham undertakings. Negotiations are in progress for the Chelmsford undertaking, which sold about 3½ million units in the year 1933.

CURRENT YEAR'S GOOD START.

This year has started well and the number of units sold has already increased over this time last year, from 174,507,770 to 224,343,260, an increase of nearly 30 per cent. After the first quarter of this present year (1934) reductions in rates are to take effect in Woodford, Romford, Mitcham, Coulsdon and Purley. Great success is being met with in the new market of public street lighting. Large London boroughs as well as numerous other local authorities are turning to the company for assistance in better and more economical means of street lighting by electricity.

Associated companies continue to show good results. A very large area, comprising the Weald Co. in Kent and Sussex, has, this year, entered the dividend-earning stage, and reductions in rates for supply there have been announced.

The report and accounts were adopted, the retiring directors and the auditors are re-elected, and a vote of thanks to the directors, staff and employés was unanimously carried.

At the conclusion of the meeting an extraordinary general meeting was held, at which was passed a resolution enabling the board to issue existing authorised Preference shares on terms more consistent with the present-day market values than were attached to those shares when authorised in 1929. 4676

COMPANY MEETING.

THE CITY OF LONDON ELECTRIC LIGHTING CO., LTD.

The ordinary general meeting of the above Company was held on March 21st at Falcon House, Aldersgate Street, E.C.

Mr. J. B. Braithwaite (the chairman) dealt first with the result of their Rating Appeal with the House of Lords, and said that as a result of that Appeal having gone against them they had had imposed upon them £45,000 a year in additional rates. He did not know whether the public realised the proportionate effect which those rates had upon their profits. That £45,000 of additional rates was more than half the total cost of their coal, and yet people talked about wanting cheap electricity. The items of expenditure over which they had no control whatever amounted to £324,442 out of their total expenditure of £574,614. He quite agreed with what Mr. George Balfour had said at the meeting of the Metropolitan Co. that savings in generation were soon extinguished by uncontrollable rates. Electricity seemed to be the milch cow when anybody wanted rates.

They put in the most efficient plant they could and they organised their business in the best possible way, but every economy which they made was wiped out—and more than wiped out very often—by additional burdens thrown upon them by the Rating Authorities. They were told that cheap electricity was essential, but every unit sold had to bear this burden, and they as purveyors to their consumers were in effect acting as merely rate collectors. He often wondered what coal merchants would say if they found themselves used in the same way. It spoke volumes for the virtues of electricity that even that handicap could not altogether check its progress.

PAST YEAR'S OPERATIONS.

The progress of the company during the past year had been comparatively slight, there having been increased output of only 2,800,000 units, but in view of all the circumstances, the depression in trade and all the other handicaps to which they had been subjected he thought they must regard that as fairly satisfactory, and they hoped to do better in the current year in that respect.

There had been three matters of importance during the year. The first was the Rating Appeal to which he had alluded. Then they had been operating under a new standard price but had not yet had that finally fixed. They were still awaiting the decision of the Electricity Commissioners. They therefore could not say whether their was any consumers' benefit for last year, but he did not think there would be because the new standard price would be very much below the one which was originally fixed and under which they had been operating.

The third matter was that as from 1st January, 1934, they were a selected station operating for the Central Electricity Board, who would take the whole of their current from Bankside and sell it back to the company. They had not yet completed the physical junction but had made all the necessary arrangements for doing so. Their capital expenditure during the year had been about £90,000, of which £70,000 had been spent in preparing for connection with the Central Electricity Board's system.

THE SINKING FUND.

In 1922-3 there had been no limitation to their dividends, but, when the Act of 1925 was passed, that was done with a view to acquiring the undertakings of the London companies practically free of charge in 1971. For that purpose they had the compulsory sinking funds imposed upon them. Sinking Fund "A" represented all the plant in use at that time, and that was to be entirely wiped out by 1971. Then there was Sinking Fund "B," which applied to additional plant put in from time to time, subject to certain charges, which would wipe out a good deal of that before 1971; the effect would be that in that year the Joint Electricity Authority would obtain the whole of the undertakings for nothing except the outstanding balance of Sinking Fund "B."

The company's dividend was limited to 7 per cent. and that would go on, he supposed, until 1971, but they had been in the habit of paying £120,000 in ordinary dividends, which meant an extra ½ per cent., and they proposed to do that again by taking the balance from Reserve Fund No. 2. He thought that shareholders might take it that they would be able to maintain that dividend for a sufficient time to enable them to reap the benefit of additional economies in various directions, which would enable them to become entitled to consumers' benefit, of which they would get a share.

REVENUE ACCOUNT.

With regard to the revenue account, the gross receipts showed a small decline of £2,768, but that was more than covered by an increased income from their invested funds. As the standard price had not yet been determined, they were unable to say what sum was due to their employee co-partners but it would probably be £42,000 or £43,000. As to the prospects for the current year, it was very difficult to say, but he could tell them that so far they had had a very satisfactory increase in units sold—some 4,000,000 extra up to date as compared with the previous year. If that continued, they ought to have a pleasant tale to tell at the end of the year, but they would not be able to pay more than 7 per cent. unless they made a consumers' benefit and earned enough money to pay it.

They had managed to make a small reduction to consumers during the year. Taking the entire output they had brought the average price down from 1.83d. to 1.782d. per unit, so that they were not slackening their efforts to reduce prices, as they felt that that was the only way in which they could hope to earn a consumers' benefit again.

The report and accounts were unanimously adopted.

4691